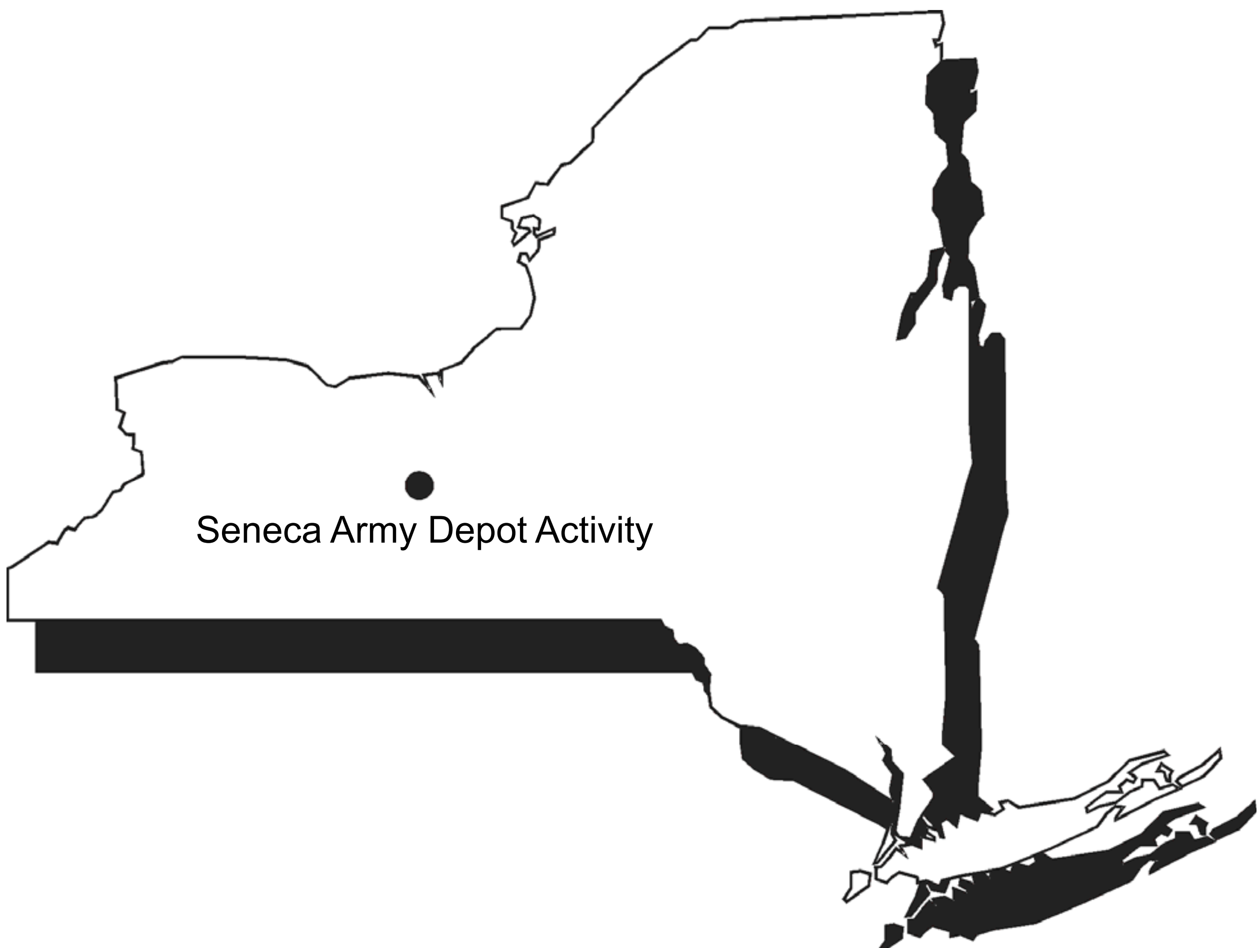
US Army, Engineering & Support Center
Huntsville, AL

Seneca Army Depot Activity
Romulus, NY



FINAL
FEASIBILITY STUDY REPORT
MUNITIONS RESPONSE ACTION
OPEN DETONATION GROUNDS
SENECA ARMY DEPOT ACTIVITY

Contract No. W912DY-08-D-0003
Task Order No. 0013
EPA Site ID# NY0213820830
NY Site ID# 8-50-006

PARSONS

FEBRUARY 2015

FINAL
FEASIBILITY STUDY REPORT

FOR

OPEN DETONATION GROUNDS MUNITIONS RESPONSE ACTION

SENECA ARMY DEPOT ACTIVITY
ROMULUS, SENECA COUNTY, NEW YORK

Prepared for:

SENECA ARMY DEPOT
5786 State Route 96
Romulus, New York 14541

and

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FEBRUARY 2015

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AOI	Area of Interest
ARAR	Applicable or Relevant and Appropriate Requirements
Army	U.S. Army
AWQS	Ambient Water Quality Standards
BIP	Blow in Place
BRAC	Base Realignment and Closure
CD	Cultural Debris
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Chemicals of Potential Concern
CWA	Clean Water Act
CY	Cubic Yards
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
ECL	Environmental Conservation Law
EE/CA	Engineering Evaluation and Cost Analysis
EM	Electromagnetic
EP	Extraction Procedure
EPA	Environmental Protection Agency
ESI	Expanded Site Investigation
ESQD	Explosive Safety Quantity-Distance
FS	Feasibility Study
GA	Classification: The best usage of Class GA waters is as a source of potable water supply. Class GA waters are fresh groundwaters.
GPR	Ground Penetrating Radar
HA	Hazard Assessment
HASP	Health and Safety Plan
HE	High Explosive
HEAT	High Explosive Anti-Tank
HFD	Hazardous Fragment Distance
HHRA	Human Health Risk Assessment
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
LORAN	Long-Range Navigation
LPS	Low Permeability Soil
LRA	Local Redevelopment Authority
LTM	Long Term Monitoring

LUC	Land Use Control
MCL	Maximum Contaminant Level
MC	Munitions Constituents
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
MSL	Mean sea level
mV	Millivolt
MW	Monitoring Well
N/A	Not Applicable
NCP	National Contingency Plan
NFA	No Further Action
NRC	Nuclear Regulatory Commission
NTU	Nephelometric Turbidity Unit
NYCRR	New York Code of Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
OB	Open Burning
OD	Open Detonation
OE	Ordnance Explosive
OSHA	Occupational Safety and Health Act
OSWER	Office of Solid Waste and Emergency Response
Parsons ES	Parsons Engineering Science, Inc.
PCB	Polychlorinated Biphenyl
ppm	parts per million
QC	Quality Control
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Levels
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SCIDA	Seneca County Industrial Development Agency
SCO	Soil Cleanup Objective

SEAD	Seneca Army Depot (old name)
SEDA	Seneca Army Depot Activity
SPDES	State Pollutant Discharge Elimination System
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	Semivolatile Organic Compound
SW	Surface water
SWMU	Solid Waste Management Unit
TAGM	Technical and Administrative Guidance Memorandum
TAL	Total Analyte List
TBC	To Be Considered
TCL	Target Compound List
TCLP	Toxicity Characteristics Leaching Procedure
TP	Test Pit
TPV	Total Present Value
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
μg/kg	Micrograms per kilogram
μg/L	Micrograms per liter
USACE	United States Army Corps of Engineers
USC	United States Code
UXO	Unexploded Ordnance
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WP	White Phosphorus

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EXECUTIVE SUMMARY

Parsons, on behalf of the U.S. Army (Army), is submitting this Feasibility Study (FS) Report for the Open Detonation (OD) Grounds (SEAD-006-R-01) [formerly SEAD-45 and SEAD-115] located at the Seneca Army Depot Activity (SEDA) in Romulus, New York. This FS considers the nature and extent of impacts that have been characterized during previous investigations, including the Site Investigation, Ordnance Explosive Engineering Evaluation and Cost Analysis (OE EE/CA), Phase I and Phase II OE Removal and Supplemental Munitions Response. This report is part of the Remedial Investigation/Feasibility Study (RI/FS) process required for compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986. SEDA has officially been closed by the Department of Defense (DoD) and the Army since its historic mission was ceased in 2000. This document has been prepared for the US Army Corps of Engineers, Huntsville District, under Contract No. W912DY-08-D-0003, DO 0013, Task Order No. 0013.

Based on the previous site investigations, it was determined that the OD Grounds requires further action. This FS presents the remedial action alternatives that were developed in accordance with the Guidance for Conducting RI/FS under CERCLA (EPA/540/G-89/004, 1988). Three alternatives were developed and evaluated using the U.S. Environmental Protection Agency (EPA)'s nine evaluation criteria for the OD Grounds. These alternatives are:

- Alternative 1: No Further Action (NFA)
- Alternative 2: Geophysical mapping, intrusive investigation, capping, and land use controls (LUCs)
- Alternative 3: Geophysical mapping, intrusive investigation, excavation, off-site disposal, and LUCs

Alternative 1, NFA, is included for comparative purposes and is the baseline for the other alternatives; the detailed analysis of this alternative identified no reduction in current risk for Alternative 1. Alternatives 2 and 3 are similar, with the following difference: under Alternative 2, soils near the OD Hill would be capped and under Alternative 3 soils near the OD Hill would be excavated, processed, and disposed off-site. The munitions and explosives of concern (MEC) Hazard Assessment (HA), which was completed as part of this FS Report, demonstrates that both Alternatives 2 and 3 are similarly protective and limit the exposure pathway to potential material potentially presenting an explosive hazard (MPPEH). The human health risk assessment (HHRA) identified risk due to exposure to groundwater for multiple receptors, and exposure to soil for the residential receptor; both Alternatives 2 and 3 would effectively eliminate the pathway for future receptors to be exposed to potential munitions constituents (MC) and MPPEH in site media. Alternative 3 rates more favorably for permanence and volume reduction and Alternative 2 rates more favorably for implementability. The cost of Alternative 3 is substantially higher than the cost of Alternative 2. The capital cost of Alternative 2 is $8.0M, with a present worth value over 30 years of $8.9M. The capital cost of Alterative 3 is $27.6M, with a present worth value of $28.0M.

The implementation of Alternative 2 would include the following elements:

- Conducting digital geophysical mapping (DGM) of the area, acquisition and removal of anomalies; all identified MPPEH will be handled and managed appropriately by trained personnel.
- Mag and dig operations with a handheld magnetometer, such as a Schonstedt, in areas that are wooded or inaccessible.
- In the areas near the OD Hill, consolidation of the impacted soil will occur under the cap area. After excavation and consolidation, additional DGM and intrusive investigation (and subsequent additional excavation, if needed) will be conducted. The excavated, non-impacted overburden will be staged on-site for potential reuse and/or incorporation under the site cap.
- Design and construction of an engineered cap to cover contaminated soils and be at least 18 inches thick over the OD Hill area. Excavated soil will be placed on the OD Hill under the cap. The cap will comply with applicable requirements of New York State (NYS) Part 360 requirements for leaving waste in-place and the applicable screening criteria outlined in Part 375.6-7 (d)(1)(ii)(b).
- LUCs will be placed on the site to prohibit the use of groundwater, prohibit digging, and prevent the use of the site for use as a daycare or a residential facility.
- Long-term monitoring (LTM) will be conducted annually to monitor and maintain the cap.
- A five year review will be conducted.

Implementation of this alternative would be highly effective in achieving the Remedial Action Objectives (RAOs), long-term effectiveness, preventing exposure, and implementability. The costs for this alternative are moderate.

1.0 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF REPORT

Parsons, on behalf of the Army, is submitting this FS Report for the OD Grounds located at the SEDA in Romulus, New York. This report is part of the RI/FS process required for compliance with CERCLA and SARA. The RI/FS at OD Grounds is being performed under the guidance of the EPA, EPA Region II, and the New York State Department of Environmental Conservation (NYSDEC). This document was prepared for the U.S. Army Corps of Engineers (USACE), Huntsville District, under Contract No. W912DY-08-D-0003, DO 0013, Task Order No. 0013.

Several characterization efforts and investigations for MPPEH and impacted soils were conducted at the OD Grounds and were summarized in the following documents:

- Expanded Site Investigation (ESI) for Seven High Priority Solid Waste Management Units (SWMU) SEAD 1, 16, 17, 24, 25, 26, 45, Seneca Army Depot (Engineering Science, Inc, December 1995);
- Final Ordnance and Explosives Engineering Evaluation/Cost Analysis Report (OE EE/CA), Seneca Army Depot (Parsons ES, February 2004);
- Final Site Specific Project Report SEAD 45/115 Open Detonation Grounds Ordnance and Explosives Removal Phase I Geophysical Survey and Cost Estimate, Seneca Army Depot (Weston, March 2005);
- Draft Phase II Ordnance and Explosives Removal Report (Weston, March 2006); and
- Additional Munitions Response Site (MRS) Investigation Report, Seneca Army Depot (Parsons ES, May 2010).

These reports serve as the basis to characterize the nature and extent of operational impacts and to assess human health and environmental risks at the OD Grounds. A human health risk assessment (HHRA) and a MEC HA were both completed as part of the FS, and they are used to evaluate the existing and residual risk at this site. This FS considers the nature and extent of impacts that were characterized in these documents, evaluates remedial action alternatives, and selects the most appropriate remedy for the OD grounds. This report is organized in accordance with the Guidance for Conducting RI/FIs under CERCLA (EPA, 1988).

Section 1.0 provides a brief overview of the characterization efforts, including background information, nature and extent of contamination, a summary of the human health risk assessment (HHRA), and a sum the MEC HA. **Section 2.0** presents the remedial action objectives (RAO) for each medium of concern and considers general response actions that meet the remedial objectives. **Section 3.0** evaluates the alternatives for each medium by preliminary screening to determine their relative merits for use in the remedial action. **Section 4.0** evaluates the remedial action alternatives in detail and provides the basis for selection of the remedy for the OD Grounds.

1.2 OD GROUNDS BACKGROUND

1.2.1 OD Grounds Description

The SEDA is located approximately 40 miles south of Lake Ontario, near Romulus, New York as shown in **Figure 1-1**. The facility is located in an uplands area, at an elevation of approximately 600 feet mean sea level (MSL), that forms a divide separating two of the New York Finger Lakes; Cayuga Lake on the east and Seneca Lake on the west. Sparsely populated farmland covers most of the surrounding area. NYS Highways 96 and 96A adjoin SEDA on the east and west boundaries, respectively.

The SEDA previously occupied approximately 10,600 acres of land located in the Towns of Varick and Romulus in Seneca County, New York. The former military facility was owned by the U.S. Government and operated by the Army between 1941 and approximately 2000, when the SEDA military mission ceased. The SEDA's historic military mission included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives, and special weapons. In 1995, the SEDA was designated for closure under the DoD's Base Realignment and Closure (BRAC) process. With the SEDA's inclusion on the BRAC list, the Army's emphasis expanded from expediting necessary investigations and remedial actions at prioritized SWMUs to including the release of non-affected portions of the Depot to the surrounding community so that the land can be reused for non-military purposes (i.e., industrial, municipal, and residential). Since the inclusion of the SEDA in the BRAC program, approximately 8,000 acres were released to the community. An additional 250 acres of land were transferred to the U.S. Coast Guard for continued operation of a long-range navigation (LORAN) station.

The OD Grounds site is located in the northwestern corner of the Depot in Seneca County, New York and is also known as SEAD-006-R-01 (formerly SEAD-45 and SEAD-115). The site, shown in **Figure 1-2**, is largely meadow with some wooded and heavily brushed areas. The OD Grounds consists of 403 acres and was used to perform open detonation and burning of munitions. This acreage includes the area surrounded by a 2,500-foot radius centered around the OD Hill. Note that the Open Burning (OB) Grounds (also known as SEAD-23) is a separate site that was previously addressed and is not included in the calculation of the OD Grounds acreage. For ease of discussion in this FS, two different portions of the OD Grounds Site were identified. They are referred to as the "Kickout Area" and the "OD Hill Area". The OD Hill Area is the location of demolition activities. The Kickout Area is the area in which blast fragments emanating from the OD Hill activity are expected to land. The boundaries of these areas are defined on **Figure 1-2**.

Access into the greater OD Grounds demolition area is possible via a paved road that enters the area from the southeast and roughly parallels the path of Reeder Creek along its western bank. The unnamed access road branches off North-South Baseline Road near Building 2104, which is located in the southeastern corner of the OD Grounds (**Figure 1-2**). Building 2104 was built in 1951 and is described as "Change House (OB/OD Grounds)". The building is not included in any lists of structures with potential unexploded ordnance (UXO) hazards or in which potentially hazardous materials were stored (Woodward-Clyde, 1997). A change house is a location for military personnel to change clothes and uniforms.

1.2.2 Future Land Uses

CERCLA guidance, Land Use in the CERCLA Remedy Selection Process, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-04, directs decision makers to achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as possible. As part of the 1995 BRAC process, a Local Redevelopment Authority (LRA) comprised of representatives from the local community was established. DoD policy described in Responsibility for Additional Environmental Cleanup after Transfer of Real Property also states that "For BRAC properties, the LRA's redevelopment and land use plan, will be the basis for the land use assumptions DoD will consider during the remedy selection process." A Land Reuse Plan was prepared and approved by the LRA in 1996 which designated parcels of land within the Depot for reuse into eight categories: Planned Industrial/Office Development, Warehousing, Prison, Conservation/Recreation, Institutional, Housing, Airfield/Special Events, and Federal to Federal Transfer. The area that encompasses the OD Grounds was determined to be "Conservation/Recreation Area". In 2005, the Seneca County Industrial Development Agency (SCIDA) revised the planned future use of property within the former Depot and added Institutional Training, Residential/Resort, Green Energy, Development Reserve, Training Area, and Utility uses. Under this revised future use plan, the OD Grounds is located in the "Conservation/Recreation" parcel of the former Depot (**Figure 1-3**). The planned future use for OD Grounds is for conservation and passive recreational purposes where there is a limited potential for soil contact. Passive recreation refers to a use of the land where there is a limited potential for soil contact (e.g., does not include playgrounds or ballparks, but would include hiking or nature trails). In addition to the consideration of future land use during the remedy selection process, NYS regulations, New York Code of Rules and Regulations (NYCRR) Title 6, Chapter IV, Subchapter B, Part 375, Subpart 375-2.8 Remedial Program, requires evaluation of remedies that will restore the site conditions to "pre-disposal conditions to the extent feasible." (NYSDEC, 2013a)

1.2.3 Geological Setting

The Finger Lakes uplands area is underlain by a broad north-to-south trending series of rock terraces mantled by glacial till. As part of the Appalachian Plateau, the region is underlain by a tectonically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones. In the vicinity of SEDA, Devonian age (approximately 385 million years ago) rocks of the Hamilton Group are monoclinally folded and dip gently to the south. No evidence of faulting or folding is present. The Hamilton Group is a sequence of limestones, calcareous shales, siltstones, and sandstones.

SEDA geology is characterized by gray Devonian shale with a thin weathered zone where it contacts the overlying mantle of Pleistocene glacial till. This stratigraphy is consistent over the entire SEDA facility. The predominant surficial geologic unit present at the site is dense glacial till. The till is distributed across the entire facility and ranges in thickness from less than 2 feet to as much as 15 feet although it is generally only a few feet thick. The till is generally characterized by brown to gray-brown silt, clay and fine sand with few fine to coarse gravel-sized inclusions of weathered shale. Larger diameter weathered shale clasts (as large as 6-inches in diameter) are more prevalent in basal portions of the till and are probably ripped-up clasts removed by the active glacier.

The bedrock underlying the site is composed of the Ludlowville Formation of the Devonian age, Hamilton Group. Merin (1992) also cites three prominent vertical joint directions of northeast, north-northwest, and east-northeast in outcrops of the Genesee Formation 30 miles southeast of SEDA near Ithaca, New York. Three predominant joint directions, N60E, N30W, and N20E are present within this unit (Mozola, 1951). These joints are primarily vertical. The Hamilton Group is gray-black, calcareous shale that is fissile and exhibits parting (or separation) along bedding planes.

1.2.4 Hydrogeology

Regionally, four distinct hydrologic units have been identified within Seneca County (Mozola, 1951). These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift. Overall, the groundwater in the county is very hard, and therefore, the quality is minimally acceptable for use as potable water.

Regionally, the water table aquifer of the unconsolidated surficial glacial deposits of the region would be expected to flow in a direction consistent with the ground surface elevations. Geologic cross-sections from Seneca Lake and Cayuga Lake can be found in Mozola (1951) and Crain (1974). The geologic cross-sections suggest that a groundwater divide exists approximately half way between the two Finger Lakes. SEDA is located on the western slope of this divide and therefore regional groundwater flow is expected to be primarily westward towards Seneca Lake. Except for local variations in the hydrogeology, the Site hydrogeology is overall consistent with the regional hydrogeology.

Surface drainage from SEDA flows to five primary creeks. In the southern portion of the Depot, the surface drainage flows through man-made drainage ditches and streams into Indian and Silver Creeks. These creeks then merge and flow into Seneca Lake just south of the SEDA airfield. The central part and administration area of the SEDA drain into Kendaia Creek. Kendaia Creek flows in a predominant westerly direction, and discharges into Seneca Lake at a location north of Pontius Point and the SEDA's former Lake Shore Housing Area. The majority of the northwestern and north-central portion of the SEDA drains into Reeder Creek. Reeder Creek flows predominantly northwesterly and leaves the Depot at a point that is north of the Open Detonation Area (i.e., SEAD-45) and west of the former Weapons Storage Area or the "Q" (i.e., SEAD-12) before it turns to the west and flows into Seneca Lake. The northeastern portion of the Depot, which includes a marshy area called the Duck Pond, drains into Kendig Creek and then flows north into the Cayuga-Seneca Canal and to Cayuga Lake. Other minor creeks are also present and drain portions of the Depot.

Surface water flow from precipitation events at OD Grounds is controlled by local topography which slopes gently to the east-northeast, as there is little relief on-site other than the demolition mound. In general, surface water flows east making its way into a network of drainage swales throughout the site that eventually lead into Reeder Creek, a sustained surface water body. Reeder Creek flows to the north-northwest along the eastern border of the OD Hill.

The groundwater flow direction in the till/weathered shale aquifer on the site is to the east-northeast based on the groundwater elevations measured in nine monitoring wells (MW) on April 4, 1994. Note that the wells at the OD Grounds have not been sampled or gauged since the 1995 ESI was conducted. The distribution of groundwater in the till aquifer is characterized by moist soil with coarse-grained lenses of water-saturated soil and in most instances the deeper weathered shale horizons were saturated. The recharge of water to the wells during sampling in 1994 was generally poor. Groundwater elevations collected within the Open Burning Grounds between 2007 and 2012 show a general groundwater flow to the northeast (**Figure 1-4**). Comparison between the 1994 data and the recent groundwater elevations suggests an approximately NNW-SSE trending groundwater divide through the western portion of the Open Burning Grounds (approximately at the large C-shaped berm visible in **Figure 1-4**) (Parsons, 2013). Groundwater east of the divide flows to the northeast while groundwater west of the divide flows to the southwest. Groundwater elevations measured during the ESI suggest a northeasterly direction of groundwater flow in the in the OD Grounds (**Figure 1-4**) (Parsons, 1995).

1.2.5 SWMU History

The OD Grounds was used to destroy munitions. Operations at the OD Grounds began circa 1941 when the Depot was first constructed and continued at regular intervals until circa 2000 when the military mission of the Depot ceased. This facility operated under Interim Status as a Subpart X Miscellaneous Unit for open burning and open detonation of explosives, propellants and pyrotechnics and other unserviceable ammunition under 40 Code of Federal Regulations (CFR) Part 265 and NYCRR 373-1. Due to the closure of the Site, the RCRA permit was not finalized as Final Status. RCRA Closure requirements and RCRA Corrective Action requirements were deferred to the CERCLA program by the NYSDEC. Under this deferment, the Army was permitted to open burn and open detonate all MPPEH to safely dispose and demilitarize the materials in association with any remedial activities. Final Closure of the open burning tray will occur at the end of these activities.

During operations, munitions were placed in a hole created in the hill with additional demolition material, covered with a minimum of 8 feet of soil, and detonated remotely. After demolition was completed, explosively displaced portions of the mound were reconstructed by bulldozing displaced and native soils back into the central earthen mound.

The historic operations resulted in MEC, MPPEH, munitions constituents (MC), and munitions debris (MD) being expelled from the OD Hill to the surrounding area. The investigations revealed that the area encompassing 1,000 feet to 2,000 feet from the OD Hill received “kickouts” from the demolition operation (**Figure 1-2**).

1.2.6 Previous Investigations and Activities

1.2.6.1 1995 Expanded Site Investigation for Seven High Priority SWMUs

Parsons Engineering Science, Inc. (Parsons ES) completed an ESI at the OD Grounds. During the ESI, surface and subsurface soil samples, groundwater and surface water samples, sediment samples were collected. The nature and extent of the impacts from the sample results is discussed in Section 1.3. In addition, ground penetrating radar (GPR) and Geonics Electromagnetic (EM) terrain conductivity meter (EM-31) surveys were performed in addition to anomaly removal. Five detailed GPR grids were conducted to further characterize several anomalies identified by the EM-31 survey. Ten test pits were excavated to identify the sources of various EM-31 anomalies.

Based on the ESI EM-31 surveys anomalies in test pits TP45-3, TP45-4, TP45-5, TP45-6 and TP45-10 were attributed to pipes, blasting wires, and conduit wires. The other test pits encountered a variety of material, including munitions fragments, wood, ash, wire, nails, etc., all of which may have contributed to the observed EM-31 anomalies. Parsons collected 14 soil samples and submitted them for laboratory analysis for volatile organic compounds (VOC), semivolatile organic compounds (SVOCs), Pesticides/Polychlorinated Biphenyl (PCB), metals, cyanide, explosives, herbicides, and nitrates. The results of the soil investigations are summarized in the Nature and Extent discussion in **Section 1.3.1** below.

1.2.6.2 2000 Ordnance and Explosives Engineering Evaluation and Cost Analysis

Parsons ES completed the field work for the EE/CA in 2000 and prepared the final report in 2004 (Parsons, 2004). The purpose of the EE/CA was to characterize the nature and extent of Ordnance and Explosives (OE), now referred to as MEC, identify potential safety problems associated with MEC, and study risk management alternatives at the various Areas of Interest (AOI). This objective was accomplished by characterizing MEC presence and developing and analyzing risk management alternatives.

The EE/CA fieldwork used geophysical survey techniques and intrusive investigations to estimate the density of the ordnance in different areas, which was then compared with the current and future activities and anticipated users. Data collected from this characterization project were also used to develop alternatives designed to reduce the risk of possible exposure to UXO within the AOIs, which included the OD Grounds. These alternatives were then evaluated to determine their effectiveness, implementability, and cost.

As part of the OE EE/CA, fifty-seven (57) 100-foot by 100-foot grids were surveyed at the OD Grounds using the EM61-MK2 (EM-61). Six grids in heavily wooded areas were also investigated by “mag and flag” surveys. In the majority of the grids surveyed with the EM61, a high density of buried metal was detected. Of the 1,337 anomalies identified in the EM61 surveyed grids, 86% were intrusively investigated. Two of the “mag and flag” surveyed grids were also intrusively investigated, although no statistics are available for these grids.

Approximately 3.5 acres of meandering path data were collected in the OD Grounds using the EM61. This data was all collected to the west and north of the grids surveyed in the OD Grounds. Due to extremely thick brush and forest to the east of the gridded area of the OD Grounds no meandering path data were collected in this direction. The meandering path data that was collected represented 2% of the 174-acre area outside of the 60-acre area investigated by the grid surveys. Of the 970 anomalies selected from the meandering path data, 72% were intrusively investigated. Of these, 19 (2.7%) were “false positives” as no discernible metallic debris was located.

Ordnance-related items were recovered from 666 of the 701 anomalies investigated (95%), and 21 of these were UXO items, now referred to as MEC/MPPEH. Density determinations were made using USACE’s UXO Calculator, and the OD Grounds meandering path AOI was defined as ‘high density’ for having a density greater than 10 anomalies/acre.

Occasionally, anomalies identified on the Anomaly Dig Sheet could not be reacquired with the instrument that performed the survey. In such instances, the anomaly was flagged at the coordinate location and the inability to reacquire the anomaly was documented on the reacquisition team dig sheet. The intrusive teams would again geophysically search the immediate area around the flag using both Schonstedt® and Foerster® metal-detectors. If again no anomaly was identified, the location was assumed to be a "false positive"; however, 10% of the "false positives" were excavated to 18 inches and re-checked using the Schonstedt® and Foerster for quality control (QC) purposes. No OE was ever found in locations where "false-positive" digs were performed.

1.2.6.3 2003 Phase I Geophysical Investigation

The Phase I Geophysical Investigation of the OD Hill was conducted between 2 June and 27 August 2003. An EM61 towed-array system was used to perform a geophysical survey in all accessible areas between 1,000 ft. and 2,500 ft. from the OD Hill (213 acres), and a "mag and flag" approach using hand-held magnetometers was used in a portion of the wooded/transect areas (9.65 acres). Results of the geophysical survey revealed that approximately 599 targets per acre exist in non-wooded areas between 1,000 ft. and 1,500 ft. of the OD Hill, approximately 139 targets per acre exist in non-wooded areas between 1,500 ft. and 2,500 ft. of the OD Hill, and approximately 208 targets per acre exist in wooded (transect) areas.

To verify the accuracy of results obtained both digitally and manually, Weston and EOTI UXO Technicians removed a total of 512 items from anomaly target locations within the non-wooded/open areas, and a total of 736 items from anomaly target locations within the transects. Of the 512 target anomalies excavated from the non-wooded/open areas, approximately 97% of the items were found at a maximum depth of 12 inches bgs. No items were identified at depths exceeding 20 inches bgs.

This investigation identified approximately 14,700 anomalies that are to be investigated in the open areas between 1,000 ft. and 1,500 ft. from the OD Hill under an area munitions response action. The anomalies identified within the 1,000 to 1,500 ft radius will be addressed as part of Alternatives 2 or 3 proposed in this FS.

1.2.6.4 2006 Phase II Ordnance and Explosives Removal Activities

The primary objective of Phase II was to reacquire, remove, and dispose of approximately 8,500 MEC/UXO[1] items and ordnance related scrap now referred to as MD located in non-wooded areas, between the 1,500 ft. and 2,500 ft. radius from the OD Hill to a depth of 4 ft. In addition, potential MEC/UXO and MD items located within 220 transects through wooded areas of the OD Grounds also required reacquisition, removal, and disposal.

Between September 2003 and March 2005, Weston removed 7,940 out of the 8,500 identified anomalies within the open area of the OD Grounds. In the wooded area, Weston investigated and removed and cleared 169 of the 220 transects.

[1] The Phase II report, and other older reports, use the term UXO to describe unexploded ordnance. UXO items were reclassified and included in the broader category of MEC. In this paragraph, both terms were used for clarity.

In the open area, a total of 9,497 individual items were removed between the 1,500-ft and 2,500-ft. radius. Weston removed 6,663 individual items from the wooded areas. The percent of items recovered in both Phase I and Phase II investigations that were classified as OE (MEC or MPPEH) was 7%. Approximately 58% of the items recovered were classified as MD and 28% were classified as cultural debris (CD) (i.e., non-munitions related debris such as barbed wire, horseshoes, and consumer hardware). Six percent (6%) of the items recovered were no-contacts.

1.2.6.5 2010 Supplemental Work

The focused site investigation was conducted by Parsons ES in 2010 and included topographic and geophysical surveys of specific areas within the OD Grounds and the collection and analysis of soil samples from TP and surface soil locations. The objectives of the site investigation included determining MC concentrations in sub-surface and surface soils in or adjacent to the OD Hill; depth of soil and debris in saturated areas for geophysical mapping to identify individual anomalies; determine the volume of soil in the OD Hill; and estimation of the bedrock surface at the OD Grounds. The results of the MC sampling indicated that metal concentrations are generally greatest in soils closest to the OD Hill and decrease with distance from OD Hill. With one exception, concentrations of metals detected at a distance greater than 1,000 ft from the OD Hill were below the relevant criteria levels. The topographic investigation concluded that bedrock underlying the area of the OD Hill mound is estimated to vary from 10 to 20 ft. bgs. Based on the topographic survey, the estimated volume of the earthen mound above ground surface is 38,000 cubic yards (cy). The estimated volume of soil in the OD Hill above bedrock surface is 75,000 cy (Parsons, 2010).

The Army selected five test plots in order to provide a preliminary assessment of the vertical deposition of MPPEH, MD, MC, and CD located at different distances and in different directions from the OD Hill. As part of this investigation, if the initial geophysical survey at a test plot location continued to show high levels of geophysical anomalies, additional one-foot excavations and repeat EM surveys were conducted as directed by the Army.

Review of the data gathered indicates that anomaly densities generally decrease with depth of excavation, especially at distances greater than 100 to 200 feet from the OD Hill mound. The overall assessment of the data suggest that there may be a directional component to the vertical deposition of anomalies, as is evidenced by the absence of anomalies to the southeast of the OD Hill and the presence of anomalies to the northeast and northwest at roughly comparable distances from the detonation site. Additionally, the results suggest that areas in close proximity to the OD Hill may have more subsurface anomalies due to the extensive amount of soil rework that was done at this Site during its operational period.

1.3 NATURE AND EXTENT OF IMPACTS

1.3.1 Soil

As part of the development of this FS, analytical data are compared to November 2012 EPA Regional Screening Levels (RSL) for industrial soil and the NYSDEC approved Remedial Program Soil Cleanup Objectives (EPA, 2012; NYSDEC, 2013a). 6 NYCRR Subpart 375-6, effective December 2006, includes the soil cleanup objective (SCO) tables developed for unrestricted use and restricted use scenarios

(NYSDEC, 2013b). The OD Grounds is located in the future Conservation/Recreation area (**Figure 1-3**); however, the site should not be used in cases where contact with the soil is likely (e.g., playgrounds and ball parks). Hiking trails and scenic walking paths are considered acceptable. Because the OD Grounds is a former MRS, any remedy will include LUCs implemented at this area that will prohibit digging, prevent use of/access to groundwater, and prohibit the area for use as a residential/child care facility. As a result, the NYSDEC restricted use SCOs for the commercial use scenario are considered to be appropriate criteria for the OD Grounds. Note that the SCOs in 6 NYCRR Subpart 375-6 had not been developed at the time of previous investigations and therefore were not considered in the 1995 ESI. The ESI report summarized that heavy metals are contaminants of concern.

Soil sampling was performed at the OD Grounds during several previous investigations. All data gathered were used to determine the nature and extent of impact on soil due to previous site activities. **Figure 1-5A** and **Figure 1-5B** show the approximate locations of the soil samples collected at the OD Grounds. A summary of surface and subsurface soil exceedances data are presented in **Table 1-1**. The full dataset is provided in **Appendix A-1**. A total of ninety seven soil samples were collected and analyzed for inorganic metals. Forty-seven samples collected were analyzed for explosives and thirty-five samples were analyzed for SVOCs, herbicides, pesticides, and PCBs. Sixteen samples were analyzed for VOCs. The analytical data are compared to the NYSDEC Commercial SCOs and EPA RSLs for Industrial Soil. None of the VOC, herbicide, or explosive results exceeded the Commercial SCOs or industrial RSLs. The SVOC concentrations were all below the Commercial SCOs; however, one SVOC (2,4 dinitrotoluene) exceeded its respective industrial RSL (note that there is no corresponding SCO value). The concentration of one PCB, Aroclor-1254, exceeded both its Commercial SCO and industrial RSL screening criteria in one sample. Among the metals, cadmium, copper and mercury were the only metals to exceed their respective Commercial SCOs. In comparison, arsenic, cadmium, and lead exceeded their respective industrial RSLs.

Figures 1-6A and **1-6B** illustrate that the concentrations of the metals in the soil are higher close to the OD Hill and the concentrations decrease as the distance increases into the Kickout area of the OD Grounds. The figures highlight that there were no exceedances of NYSDEC Commercial SCOs in the Kickout area. Samples collected for metals analysis were also sent for synthetic precipitation leaching procedure (SPLP) analysis during the 2010 Supplemental Work. The discussion of these results and samples are included in Section 1.4.1.

1.3.2 Ditch Soil

Four ditch soil samples were collected during the ESI. Three of the samples were collected from the drainage ditches located downgradient of the OD Hill and the fourth sample was collected from a low-lying area northwest of the OD Hill. The material at the base of the drainage swales is site soil. The ditch soil samples collected during the ESI are located approximately 500 ft to 600 ft from the OD Hill, or within or close to the "OD Hill area". These samples were analyzed for VOCs, SVOCs, metals, PCBs, pesticides, herbicides and nitrate/nitrite nitrogen (**Appendix A-4**).

VOCs and herbicides were not detected in the samples. Several SVOCs, nitroaromatics, pesticides, and PCBs were detected at low concentrations.

A summary of the ditch soil analytical results from the ESI and a comparison to the commercial SCOs is presented in **Table 1-2**. The results show that cadmium, copper, and mercury were detected at concentrations slightly elevated compared to their respective commercial SCOs. The single exceedance of the commercial SCOs was limited to cadmium, which was detected at the low-lying ditch soil sample location at a concentration of 25.6 mg/kg compared to the commercial SCO of 9.3 mg/kg. Cadmium, copper, and mercury were detected above the commercial SCOs in the drainage swale samples located downgradient of the OD Hill, with concentrations as follows: Cadmium 14.9 mg/kg (SCO = 9.3 mg/kg); Copper 814 mg/kg and 323 mg/kg (SCO = 270 mg/kg); Mercury 5.3 mg/kg and 4.4 mg/kg (SCO = 2.8 mg/kg). These concentrations of metals in the ditch soil are similar or lower than the levels observed at similar locations in the soil samples. The ditch soil results are grouped with the soil results located in the OD Hill area.

1.3.3 Groundwater

Groundwater results discussed below were sampled over an approximately 20 year time period from both the OD and OB Grounds (**Appendix A-2**). Water quality screening criteria used for comparison in this FS report includes the lower of the values from either NYS Ambient Water Quality Standards (AWQS) for Class GA groundwater or EPA National Primary Drinking Water Regulations Maximum Contaminant Level (MCL) (EPA, 2012; NYSDEC, 2004). A consolidated summary of groundwater exceedances from these reports is presented in **Table 1-3**.

Groundwater sample results from the 1995 ESI suggest no gross contamination of the groundwater within the OD Grounds. There were no VOC exceedances and no pesticides or herbicides were found in the groundwater samples collected. Two explosives were detected in the groundwater one time each. One of the explosives (1,3-Dinitrobenzene) was detected below its respective groundwater criteria. NYS AWQS and EPA MCL screening criteria for the other explosive (HMX) do not exist; however, the detected value (0.5 ug/L), for comparison, is far less than the EPA's tap water RSL of 780 ug/L.

One SVOC [Bis(2-Ethylhexyl)phthalate] was detected in four groundwater samples at concentrations above the criteria value. Ten metals (antimony, beryllium, chromium, iron, lead, manganese, mercury, nickel, sodium, and thallium) were found in one or more the groundwater samples at concentrations above the criteria value. The groundwater sampling methodology used during the 1995 ESI resulted in high turbidity in the samples. The elevated metals concentrations are likely due to the turbidity levels (e.g., values as high as 9860 nephelometric turbidity units [NTU]) and are associated with suspended particles rather than representative of actual conditions in the groundwater aquifer. Thallium was detected in one sample and only slightly exceeded its screening criterion (**Table 1-3**). The results of the 1995 ESI suggest that the groundwater at the OD Grounds is not impacted by historic site activities.

Adjacent to the OD Hill, the groundwater within the OB Grounds site was sampled prior to the 1994 OB Grounds RI and six wells from this site currently are part of a long-term monitoring (LTM) program (Parsons, 1994, 2013). Groundwater monitoring for explosives, metals, total organic carbon, total organic halides, pH, pesticides, and nitrates between 1981 through 1987 indicated no exceedances of then current NYS AWQS except for iron and manganese. In 1989, sampling was conducted on ten additional installed wells and six of the seven previous wells. This round of sampling examined Extraction Procedure (EP) Toxicity metals and explosives. No metals or explosives exceeded applicable screening criteria.

Results from Phase I and II groundwater sampling were compiled in the 1994 OB Grounds RI Report (Parsons, 1994). Analytes examined during these sampling events included volatile organic analysis (VOA), target compound list (TCL) for semi-volatiles, pesticides, and PCBs, total analyte list (TAL) metals, and explosives. Groundwater was found to be minimally impacted by metals and explosives. Based on these results, the 1996 OB Grounds FS Report determined that groundwater was not a medium of concern (Parsons, 1996).

Based on the 1998 Record of Decision (ROD) for the OB Grounds, lead and copper were the contaminants and media of concern proposed for the remedy in the site soils and sediments adjacent to Reeder Creek (Parsons, 1998). Between 2007 and 2012, LTM of wells within the OB Grounds for copper and lead has shown no evidence of lead or copper in the groundwater above the cleanup goals subsequent to the completion of the remedial action for the Site. These findings are consistent with the groundwater analytical results obtained during the RI stage (1990s) of work at the Site, indicating that there is no evidence of groundwater quality deterioration over approximately 20 years.

Although the OB Grounds are not immediately downgradient from the OD Grounds, the results from previous investigations at the OB Grounds site can be used as an analogue for the potential groundwater contamination expected in the adjacent OD Grounds. Potential contaminants, fate and transport, and exposure scenarios are expected to be the same as was discussed in previous studies. As such, groundwater is not expected to be a medium of concern within the OD Grounds; however, potential examination of the groundwater may be appropriate subsequent to the remedial alternative evaluation in this FS.

1.3.4 Surface Water

During the ESI, the NYSDEC AWQS for Class C surface water were used to evaluate the OD Grounds surface water conditions (**Appendix A-3**) (NYSDEC, 2004). A summary of surface water data from the ESI is presented in **Table 1-4**. Four surface water samples were collected as part of the OD Grounds investigation. Three of the surface water samples were collected from drainage ditches located downgradient of the OD Hill, and the fourth sample was collected from a low-lying area northwest of the OD Hill. No VOC, SVOC, pesticide, PCB, herbicide compounds were found in the samples collected. Seven metals aluminum, cadmium, copper, iron, lead, mercury, and zinc were found in three of the four surface water samples at concentrations above the associated criteria value. In addition, nitroaromatic compounds were found in two of the surface water sample collected. The surface water samples were collected from drainage swales that were typically dry and the water sampled likely represented surface runoff from a recent precipitation event, rather than site surface water. The four surface water samples collected were from ephemeral drainage ditches and a low-lying swale. These on-site surface water pools are not classified by NYSDEC as surface water bodies and therefore NY Ambient Water Quality Concentrations (AWQC) do not apply. Surface water is not considered a media of concern.

During the 1994 OB Grounds RI, surface water sampling was conducted within Reeder Creek (**Figure 1-4**) (Parsons, 1994). Reeder Creek is a recognized surface water body and therefore AWQCs would apply to human and ecological receptors. Surface water samples were collected from Reeder Creek up- and down-gradient of the OB Grounds. Reeder Creek serves as drainage for much of the OD Grounds; therefore, these samples were downgradient of various portions of the OD Grounds. Results from Reeder Creek were compared to recent NYS AWQC values. No significant impacts to the surface water were found; therefore, surface water is not considered a medium of concern.

1.3.5 Sediment

In conjunction with surface water samples, collocated sediment samples were collected from within Reeder Creek (**Figure 1-4**) (Parsons, 1994). Arsenic, copper, lead, manganese, mercury, nickel and zinc exceeded NY Sediment Criteria values. These exceedances were for a "to be considered" (TBC), therefore sediment was retained as a media of interest in the 1996 OB Grounds FS. As part of the OB Grounds remedial action, impacted sediment was excavated and removed from the creek. Since the removal of sediment, the inspections of Reeder Creek have found minimal sediment in various sections. Recent inspections of Reeder Creek noted that the streambed was observed to contain exposed bedrock and fractured shale pieces and thin organic/sediment layers which appear to be from decomposition of fallen leaves and the migration of tree material stockpiles by beavers in previous seasons and not the result of active erosion of the site soil and soil transport (Parsons, 2014). Evidence for excessive erosion into the creek was not found. Current monitoring at OB Grounds suggests no visual impacts to Reeder Creek.

1.3.6 Geophysics

All geophysics efforts conducted during previous investigations were followed by investigation of a select number of anomalies and target areas. The OD Grounds area was included in various geophysical investigations in the past. The results of the geophysical investigation and the following investigation of anomalies and targets are discussed in detail in **Section 1.2** – Previous Investigation.

1.4 FATE AND TRANSPORT

This section presents an overview of the fate and transport characteristics for the site contaminants identified as constituents that have an impact on the applicable matrix at the OD Grounds. Contaminants of concern may be selected because of their intrinsic toxicological properties, because they are present in large quantities, or because they are presently in or potentially may move into critical exposure pathways (e.g., drinking water supply) (EPA, 1988).

Sediment and surface water collected on-site and downgradient of the site do not show gross contamination of site media indicative of an observed release. Conditions observed within Reeder Creek were addressed during the OB Grounds and are no longer representative of current site conditions (Parsons, 1994). Current conditions in the creek exhibit little to no sediment in the creek bottom and there is no evidence of migration or erosion of nearby soils into the creek (Parsons, 2013). There was no evidence of a release to groundwater from either on-site samples or samples collected from an adjacent site. Constituents of concern for this site are MC (metals) in soil and potential items of MPPEH.

Understanding the fate of the various MEC and MC contaminants potentially present in or released to the environment is important to evaluate the potential hazards or risks posed by those contaminants to human health and/or the environment. For example, MEC may be found on the ground surface or be below grade; however, it is possible for natural processes to result in the movement, relocation, or unearthing of the MEC, thereby increasing the chance of its subsequent exposure to human receptors. Furthermore, MC may remain inside intact munitions or chemicals that may have been released to the environment during operational activities.

Analytical results from environmental samples and observations from previous geophysical and anomaly investigations indicate the presence of MEC/MD, metals, nitrates and explosives at the OD Grounds. The following paragraphs discuss potential migration processes for, the persistence of, and the potential migration routes of MEC/MD and of the Chemicals of Potential Concern (COPCs) present at the site.

Many different environmental processes act upon MC, which may influence or alter their availability to interact with receptors. These processes depend on the media in which the source (MEC or MD) exists and the exposure of MC to the processes. These processes work through the different media: air, soil, surface water, groundwater, or biota. The following are short descriptions of these processes as described in Hewitt, et al. (2003).

- **Advection** – the passive movement of a solute with flowing water.
- **Dispersion** – the observed spreading of a solute plume, generally attributed to hydrodynamic dispersion and molecular diffusion.
- **Adsorption/desorption** – the process by which dissolved, chemical species accumulate (adsorption) at an interface or are released from the interface (desorption) into solution.
- **Diffusion** – the migration of solute molecules from regions of higher concentration to regions of lower concentration.
- **Biotic transformation** – the modification of a chemical substance in the environment by a biological mechanism.
- **Oxidation/reduction –** reactions in which electron(s) are transferred between reactants.
- **Covalent binding** – the formation of chemical bonds with specific functional groups in soil organic solids.
- **Polymerization** – the process by which the molecules of a discrete compound combine to form larger molecules with a molecular weight greater than that of the original compound, resulting in a molecule with repeated structural units.
- **Photolysis** – the chemical alteration of a compound due to the direct or indirect effects of light energy.
- **Infiltration** – the process by which water enters the soil at the ground surface and moves into deeper horizons.

- **Evapotranspiration** – the collective processes of evaporation of water from water bodies, soil and plant surfaces, and the transport of water through plants to the atmosphere.
- **Plant root uptake** – the transport of chemicals into plants through the roots.
- **Sedimentation** – The removal from the water column of suspended particles by gravitational settling.

1.4.1 Metals

The analytical results from the soil samples collected during the 2010 OD Grounds Supplemental work indicate that metal concentrations are highest in samples collected in close proximity to the OD Hill, and generally decrease in the Kickout area as distance from the OD Hill increases.

Once all total metal concentration results were received and evaluated, eight samples were selected for leachability determinations using the SPLP (EPA SW-846 Method 1312) in combination with EPA SW-846 Method 6010 and 7471, as appropriate for the RCRA eight metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) and other metals of interest (e.g., antimony, cobalt, copper, vanadium, and zinc). The SPLP method was implemented in an effort to determine the ability of a material in the soil to potentially impact the groundwater or surface water, and, therefore, is relevant to the discussion of fate and transport. These samples were representative of the conditions within 500 feet distance from the center of the OD Hill. The results of these analyses are presented in **Appendix A-5**. Total metal analysis results presented were compared to EPA's RSLs for residential soils and NYSDEC Commercial SCO values, while the SPLP results are compared to NYSDEC GA Groundwater Effluent values. A detailed evaluation of the data is provided in the Completion Report for Additional MRS Investigation at Seneca Army Depot (Parsons, 2010).

A review of the data indicates that all of the metals detected show some potential to leach to groundwater. Two metals, mercury and lead, show the highest number of samples affected (i.e., six) at levels of potential concern, while cadmium and copper are also observed to be of potential concern when total soil concentrations move up to and above the Commercial SCOs.

While metals can be described by a range of mobilities, their transport abilities can generally be characterized by the same underlying principles. The mobility of metals within a soil system is primarily associated with the movement of water through that system. This mobility is affected by the solubility of the metal and its compounds, as well as chemical parameters affecting the oxidation state of the metal in solution. Metals associated with the aqueous phase of soil are subject to movement with soil water and may be transported through the vadose zone to groundwater. However, the rate of migration of the metal usually does not equal the rate of water movement through the soil due to fixation and adsorption reactions (Dragun, 1988). Metals, unlike organic compounds, cannot be degraded (McLean and Bledsoe, 1992). Metals become immobile due to mechanisms of adsorption and precipitation. Metal-soil interactions are such that when metals are introduced at the soil surface, downward transportation does not occur to any great extent unless the metal retention capacity of the soil is overloaded, or metal interaction with the associated waste matrix enhances mobility.

1.4.2 MPPEH/MEC/MD

There are two primary natural processes that can result in the migration or exposure of MPPEH/MEC items that might be present at a site: erosion and frost heave. Natural erosion of soil over time by the wind or by water (surface water or precipitation) can result in the exposure of MEC below grade by the removal of the overlying soil. In some cases, if soil is unstable and the erosive force is sufficient to act on the size of MEC item(s) present, this process can also result in the movement of MEC from its original position to another location (typically somewhere downstream of the wash). This is not anticipated to be the case at the OD Grounds as there has been no visual indication of this occurring on-site.

In addition to erosion, below grade objects have been known to move or migrate toward the surface during freezing and thawing cycles. This occurs when cold penetrates into the ground and water below the buried objects freezes and expands, gradually pushing the items upwards. This phenomenon is often referred to as “frost heave” and is most likely to affect items buried above the frost line. Soil type influences the occurrence of frost heave: gravel, sand, and clay are not typically susceptible to the process, whereas silty soil is susceptible.

The 2010 Supplemental Work conducted at the OD Grounds concluded that the geophysical anomalies, which were indicative of potential presence of MPPEH showed a general decrease in density from saturated levels (i.e., 600 anomalies per acre) at surface elevations to lower densities at depth at each test plot; this is especially true for the test plots that are further from the initial point of detonation. The study also concluded that directional and point-of-detonation distance variations may be related to the vertical distribution of geophysical anomalies in the soil surrounding the detonation site.

1.5 HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment (HHRA) was conducted for the OD Grounds and is presented as an appendix to this FS in **Appendix B**. The objectives of the risk assessment were to:

- Assess the OD Grounds conditions for protectiveness of human health and the environment;
- Determine whether additional response actions are necessary at OD Grounds;
- Identify COCs and provide a basis for determining levels of chemicals of concern that are adequately protective of human health and the environment; and
- Provide a basis for comparing potential health impacts of various remedial alternatives, and evaluate selection of the No-Action remedial alternative, where appropriate.

To meet these objectives, the risk assessment generally follows EPA guidance (the Risk Assessment Guidance for Superfund [RAGS] series of guidance documents) and incorporates exposure scenarios and assumptions that are appropriate for current and anticipated future land use at this site (EPA, 1989). The HHRA provides an evaluation of the potential risks to human health posed by constituents detected in surface soil, combined surface and subsurface soil, groundwater and surface water associated with the OD Grounds at SEDA.

This risk assessment divides the OD Grounds into two areas for assessment purposes based on differing potential risk observed during previous investigations. The density of potential MEC is highest at the center of the OD Grounds, in the vicinity of the OD Hill where the demolition activities took place and areas in the immediate vicinity that received most of the "kick-outs" from those activities. This area is referred to as the "OD Hill area" in this risk assessment. The second area includes areas further away from the OD Hill that received kick-outs, but in lower densities. This second assessment area is referred to as the "Kickout Area".

1.5.1 Baseline Human Health Risk Assessment

A conceptual site model (CSM) is used to qualitatively define the type of potential exposures to contaminants at or migrating from a site (i.e., to systematically evaluate the effect of chemicals in relevant media on potential receptors). The CSM is used to summarize existing site characterization data, including assumptions about land and groundwater use, and to complete the qualitative exposure pathway assessment. An exposure pathway evaluation describes how a receptor could be exposed to COPCs at, or migrating from, a site. The site-specific CSM for potential human exposures is depicted in **Figure 1-7A** (OD Hill Area) and **Figure 1-7B** (Kickout Area). In accordance with the site-specific CSM, risk was quantitatively or qualitatively evaluated for the following potential human exposure scenarios to contaminants found within the OD Hill Area and Kickout Area:

- Exposure of hypothetical future residents;
- Exposure of hypothetical future excavation / construction workers;
- Exposure of future park workers; and
- Exposure of current and future recreational users.

Exposure scenarios selected for evaluation are anticipated to account for the range of reasonably anticipated exposures under current and future conditions at SEDA. The exposure assumptions used for estimating constituent intake are presented in **Appendix B**, Table 2.6 (soil), Table 2.7 (groundwater), and Table 2.8 (surface water). There are no complete exposure pathways for sediment.

The exposure areas evaluated in this risk assessment were defined considering the results of the source area investigation and activity patterns of the potential receptors being evaluated in the HHRA. For evaluation of soil, the OD Hill Area and the Kickout Area were evaluated as separate exposure areas. All groundwater wells were located within the OD Hill Area or the OB Area. Groundwater evaluation was conducted on a combined data set, including data from all wells, as well as data from each well individually. For surface water, three exposure areas were evaluated, the on-site drainage ditches in the OD Hill Area, the portion of Reeder Creek upstream of the Kickout Area, and the portion of Reeder Creek that passes through the Kickout Area and all downstream locations. Once Reeder Creek enters the Kickout Area, all locations downstream from that point are potentially affected by munitions activities at the OD Grounds and considered together.

Exposure point concentrations are the concentrations of chemicals in a given medium to which a receptor may be exposed at a specific location known as the 'exposure point'. Each groundwater sampling location was considered an exposure point. Therefore, a groundwater EPC was identified as the maximum detected concentration of each COPC in each well. Surface water EPCs were the maximum detected concentration of each COPC. Risk for each surface water exposure area was estimated using the maximum detected concentration from each area. For receptors potentially exposed to soil, an EPC was calculated for soil intervals 0 - < 2 feet bgs and 0 – ≤ 15 feet bgs. EPCs were calculated for each soil COPC using the USEPA's statistical program ProUCL, version 5.0.00 (USEPA, 2013).

Cumulative carcinogenic risks and noncarcinogenic hazards estimated for the four receptor groups at the site are shown in Exhibit 1.5-1. The cumulative risk/hazard estimates described below include chromium(III). The cumulative risk/hazard estimates that include chromium(VI) show similar patterns (Exhibit 1.5-2). Chromium(VI) is not expected to be present at the site based on past munitions-related activities and is not summarized below.

Exhibit 1.5-1
Human Health Quantitative Cumulative Risk Summary for all Media
Seneca Army Depot Activity

All COPCs including chromium(III)

Receptor and Medium	Exposure Pathways	Total Carcinogenic Risk (1)	Total Hazard Index - Child (1)	Total Hazard Index - Adult (1)
Receptor: Hypothetical Future Resident				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	2.8E-05	**5.8**	0.60
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	5.8E-05	**5.3**	0.55
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	**1.8E-04**	**51**	**30**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	6.7E-07	**3.0**	0.32
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	4.6E-07	0.63	0.22
Receptor: Hypothetical Future Excavation/ Construction Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	8.2E-08	--	0.14
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	6.3E-08	--	0.046
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	1.9E-08	--	0.13
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	1.6E-08	--	0.025
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	1.5E-09	--	0.032
Receptor: Future Park Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	5.6E-06	--	0.37
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	9.8E-05	--	**19**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	2.9E-06	--	0.19
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	1.0E-07	--	0.026
Receptor: Current and Future Recreational User				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	1.8E-06	0.39	0.039
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	1.3E-05	**3.4**	**2.0**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	1.0E-06	0.000017	0.0000016
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	6.3E-08	0.086	0.030

Exhibit 1.5-2
Human Health Quantitative Cumulative Risk Summary for all Media
Seneca Army Depot Activity

All COPCs including chromium(VI)

Receptor and Medium	Exposure Pathways	Total Carcinogenic Risk (1)	Total Hazard Index - Child (1)	Total Hazard Index - Adult (1)
Receptor: Hypothetical Future Resident				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	6.5E-05	**6.0**	0.62
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	9.1E-05	**5.5**	0.57
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	**1.2E-03**	**54**	**32**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	2.2E-05	**3.1**	0.33
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	7.5E-05	0.87	0.32
Receptor: Hypothetical Future Excavation/ Construction Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	2.1E-07	--	0.15
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	9.7E-08	--	0.048
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	5.1E-07	--	0.15
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	4E-08	--	0.026
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	2.6E-07	--	0.043
Receptor: Future Park Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	1.3E-05	--	0.39
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	**5.0E-04**	--	**20**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	7.0E-06	--	0.20
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	1.6E-06	--	0.0289
Receptor: Current and Future Recreational User				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	4.4E-06	0.41	0.041
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	6.3E-05	**3.6**	**2.1**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	2.5E-06	0.0083	0.00080
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	1.0E-05	0.120	0.0437

(1) Cancer Risks and Hazard Indices were calculated by summing across exposure routes for each receptor.

(2) The greatest risk associated with groundwater is from MW 45-4.

(3) The surface water most likely to be encountered at the site is from the drainage ditches onsite. For a summary of risk associated with other surface water bodies, see Table 2.79.

-- = Cumulative Hazard not calculated for a child for this receptor.

A summary of the risks are as follows:

Hypothetical future resident exposed to surface soil, combined surface and subsurface soil, groundwater as potable water, and surface water:

- Cumulative carcinogenic risks range from 2 x 10^{-4} (groundwater in MW45-4) to 7 x 10^{-7} (surface soil in Kickout Area). The highest cumulative carcinogenic risk, which is outside USEPA's acceptable carcinogenic risk range of 1 x 10^{-4} to 1 x 10^{-6}, is due to exposure to groundwater as potable water in the center of the OD Hill Area.
- Cumulative noncarcinogenic hazards for a child range from 0.6 (surface water) to 51 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.
- Cumulative noncarcinogenic hazards for an adult range from 0.2 (surface water) to 30 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.

Hypothetical construction workers exposed to surface soil, combined surface and subsurface soil, groundwater as potable water, and surface water:

- Cumulative carcinogenic risks range from 2 x 10^{-8} (surface soil in Kickout Area) to 2 x 10^{-9} (surface water onsite). All carcinogenic risks are less than USEPA's acceptable carcinogenic risk range of 1 x 10^{-4} to 1 x 10^{-6}.
- Cumulative noncarcinogenic hazards for an adult range from 0.03 (surface soil in Kickout Area) to 0.1 (surface soil in OD Hill Area). All noncarcinogenic hazard HIs are less than 1.

Future park workers exposed to surface soil, groundwater as potable water, and surface water:

- Cumulative carcinogenic risks range from 1 x 10^{-4} (groundwater in MW45-4) to 1 x 10^{-7} (surface water onsite). All carcinogenic risks are within or less than USEPA's acceptable carcinogenic risk range of 1 x 10^{-4} to 1 x 10^{-6}.
- The cumulative noncarcinogenic hazards for an adult range from 0.03 (surface water onsite) to 19 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.

Current and future recreational users exposed to surface soil, groundwater as potable water, and surface water:

- Cumulative carcinogenic risks range from 1 x 10^{-5} (groundwater in MW45-4) to 6 x 10^{-8} (surface water onsite). All carcinogenic risks are within or less than USEPA's acceptable carcinogenic risk range of 1 x 10^{-4} to 1 x 10^{-6}.
- Cumulative noncarcinogenic hazards for a child range from 0.09 (surface water onsite) to 3 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.

- Cumulative noncarcinogenic hazards for an adult range from 0.03 (surface water) to 2 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.

Uncertainties may result in overestimated current risks/hazards. Most notably, onsite groundwater is not currently used as a potable drinking water source so the risk/hazard estimates herein may be overestimated. The estimated risks/hazards associated with potable groundwater would apply only if a well were installed for potable water. Further, there are no buildings currently onsite and there are no plans for development of the site in the future. Therefore, near- and long-term residential scenarios are hypothetical and conservative since there are no residential properties onsite currently and it is unlikely the site will be developed as residential property. Therefore, based on the exposure scenarios evaluated in this risk assessment, there are no unacceptable risks/hazards expected for any receptor as a result of exposure to soil, groundwater, or surface water based on current, or reasonably anticipated future land use.

1.6 HAZARD ASSESSMENT

A MEC HA was prepared to qualitatively assess the potential explosive hazards to human receptors associated with complete MEC exposure pathways at the OD Grounds. The results of the MEC HA show that implementation of a remedy would reduce the MEC hazard potential. A detailed description of the MEC HA conducted for the OD Grounds, including the information and assumptions used for this assessment, is included as **Appendix C** of this FS.

This MEC HA divides the OD Grounds in the same manner described for the HHRA based on differing anticipated explosive hazard characteristics. Previous investigations indicate the density of potential MEC is highest at the center of the OD Grounds, in the vicinity of the OD Hill where the demolition activities took place and areas in the immediate vicinity that received most of the “kickouts” from those activities. This area is referred to as the “OD Hill area” in this MEC HA. The second assessment area includes areas further away from the OD Hill that received kickouts, but in lower densities. This second assessment area is referred to as the “Kickout area” in this MEC HA. The locations of these two assessment areas are shown on **Figure 1-3**.

The MEC HA method focuses on hazards to human receptors and does not directly address environmental or ecological concerns that might be associated with MEC. The process for conducting the MEC HA is described in the MEC HA interim guidance document (USEPA, 2008) and uses input data based on historical documentation, field observations, and the results of previous studies and removal actions. The MEC HA interim guidance was developed by the Technical Working Group for Hazard Assessment, which included representatives from the DoD, the U.S. Department of the Interior, the USEPA, and various states and tribes. NYSDEC is not a party to the MEC HA guidance. The DoD has encouraged use of this method on a trial basis (DoD, 2009).

A qualitative baseline evaluation of the potential MEC hazards posed was conducted by reviewing each of the MEC HA input factors for the OD Hill and Kickout areas. Having generated baseline MEC HA scores for each assessment area, different remedial alternatives were further evaluated using the MEC HA method to compare how they might reduce the explosive hazards in each area. The remedial alternatives evaluated were (1) geophysical mapping, intrusive investigation, and installation of an 18-inch thick cap, followed by implementation of LUCs and (2) geophysical mapping, intrusive investigation, excavation, off-site soil disposal, followed by implementation of LUCs. These are referred to in this FS as Remedial Alternatives 2 and 3, respectively. Remedial Alternative 1 represents the no action alternative, which is the baseline scenario for this MEC HA.

Under the MEC HA method, the potential MEC hazards are evaluated qualitatively for each area by evaluating site conditions and assigning related "input factors" that generate a total MEC HA score between 125 and 1,000, with the upper limit representing the maximum level of explosive hazard. The MEC HA method identified the associated hazard levels for these scores, which range from 1 to 4. A Hazard Level of 1 indicates the highest potential explosive hazard conditions and a hazard level of 4 indicates low potential explosive hazard conditions. The basis for these hazard levels is detailed in the MEC HA interim guidance document (USEPA, 2008).

For the OD Hill area, the baseline score (the no action alternative) results in a MEC HA score of 865. Remedial Alternative 2 (geophysical mapping, intrusive investigation, and installation of an 18-inch thick cap, followed by implementation of LUCs) results in a MEC HA score of 470. Remedial Alternative 3 (geophysical mapping, intrusive investigation, excavation, off-site disposal, and implementation of LUCs) was also evaluated for the OD Hill area, and resulted in a MEC HA score of 470, the same as Alternative 2. The reduction in MEC HA score from 865 to 470 reduces the corresponding Hazard Level rating from 1 ('highest potential explosive hazard conditions') to 4 ('low potential explosive hazard conditions'). Based on these results, there is no significant difference between these remedial alternatives with respect to reduction of explosive hazards at the OD Hill area.

For the Kickout area, the baseline score (the no action alternative) results in a MEC HA score of 715. Remedial Alternatives 2 and 3 both result in a MEC HA score of 445. This reduction in MEC HA score reduces the corresponding Hazard Level rating from 3 ('moderate potential explosive hazard conditions') to 4 ('low potential explosive hazard conditions'). Based on these results, there is no significant difference between these remedial alternatives with respect to reduction of explosive hazards at the Kickout area.

In addition to providing a technique to evaluate baseline MEC hazards, the MEC HA method establishes a process to qualitatively evaluate the hazard mitigation that would be achieved by remedial actions. This process is based on assumptions made regarding the effects of a given remedial response (e.g., LUCs, surface cleanup, subsurface cleanup), coupled with modified scores for MEC HA input factors, to evaluate how the MEC HA score might be reduced following implementation of the response. The primary purpose of this process is to support the evaluation of response alternatives conducted during an FS; i.e., this evaluation should not be used as the sole basis upon which to recommend a remedial response. As with the baseline score, these total MEC HA scores and the associated hazard levels are *qualitative references only* and should <u>not</u> be interpreted as quantitative measures of explosive hazard.

Accounting for score modifications resulting from either Remedial Alternative 2 or 3, the total Hazard Level rating is reduced to a 4, 'low potential explosive hazard conditions" from a Hazard Level rating of

1 (‘highest potential explosive hazard conditions’). Based on the scores, the evaluation indicates that implementation of Alternatives 2 or 3 would result in equivalent reduction of hazards.

Table 1-1
Summary of Surface and Subsurface Soil Samples
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

					NYS SCO Commercial Use[1]		EPA RSLs Industrial Soil[2]	
Parameter	Unit	Maximum Value	Number of Times Detected	Number of Samples Analyzed	Criteria Value	Number of Exceedances	Criteria Value	Number of Exceedances
Volatile Organic Compounds								
Tetrachloroethene	µG/KG	19	6	16	150,000	0	2,600	0
Semivolatile Organic Compounds								
2,4-Dinitrotoluene	µG/KG	14,000	13	35	NA	0	5,500	1
2,6-Dinitrotoluene	µG/KG	700	2	35	NA	0	620,000	0
Acenaphthylene	µG/KG	30	3	35	500,000	0	NA	
Anthracene	µG/KG	18	2	35	500,000	0	170,000,000	0
Benzo(a)anthracene	µG/KG	50	8	35	5,600	0	2,100	0
Benzo(a)pyrene	µG/KG	82	8	35	1,000	0	210	0
Benzo(b)fluoranthene	µG/KG	55	9	35	5,600	0	2,100	0
Benzo(ghi)perylene	µG/KG	66	7	35	500,000	0		
Benzo(k)fluoranthene	µG/KG	58	7	35	56,000	0	21,000	0
Bis(2-Ethylhexyl)phthalate	µG/KG	740	9	35	NA	0	120,000	0
Chrysene	µG/KG	130	12	35	56,000	0	210,000	0
Diethyl phthalate	µG/KG	35	1	35	NA	0	490,000,000	0
Di-n-butylphthalate	µG/KG	6,800	12	35	NA	0	62,000,000	0
Fluoranthene	µG/KG	68	11	35	500,000	0	22,000,000	0
Hexachlorobenzene	µG/KG	110	11	35	6,000	0	1,100	0
Hexachloroethane	µG/KG	1,100	6	35	NA	0	120,000	0
Indeno(1,2,3-cd)pyrene	µG/KG	52	4	35	5,600	0	2,100	0
Naphthalene	µG/KG	30	5	35	500,000	0	18,000	0
N-Nitrosodiphenylamine	µG/KG	320	2	35	NA	0	350,000	0
N-Nitrosodipropylamine	µG/KG	1,600	5	35	NA	0		
Phenanthrene	µG/KG	46	9	35	500,000	0		
Pyrene	µG/KG	110	12	35	500,000	0	17,000,000	0
Herbicides								
MCPA	µG/KG	9,400	2	35	NA	0	310,000	0
Explosives								
1,3,5-Trinitrobenzene	µG/KG	190	28	47	NA	0	27,000,000	0
2,4,6-Trinitrotoluene	µG/KG	1,400	38	47	NA	0	79,000	0
2,4-Dinitrotoluene	µG/KG	1,100	36	47	NA	0	5,500	0
2-amino-4,6-Dinitrotoluene	µG/KG	680	36	47	NA	0	2,000,000	0
4-amino-2,6-Dinitrotoluene	µG/KG	500	27	47	NA	0	1,900,000	0
HMX	µG/KG	470	32	47	NA	0	49,000,000	0
Nitroglycerine	µG/KG	1,500	1	31	NA	0	62,000	0
RDX	µG/KG	5,800	39	47	NA	0	24,000	0
Tetryl	µG/KG	330	4	47	NA	0	2,500,000	0

Table 1-1
Summary of Surface and Subsurface Soil Samples
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Parameter	Unit	Maximum Value	Number of Times Detected	Number of Samples Analyzed	NYS SCO Commercial Use[1] Criteria Value[1]	NYS SCO Commercial Use[1] Number of Exceedances	EPA RSLs Industrial Soil[2] Criteria Value[1]	EPA RSLs Industrial Soil[2] Number of Exceedances
Pesticides/PCBs								
Aroclor-1254	µG/KG	2,000	2	34	1,000	1	740	1
4,4'-DDD	µG/KG	2.4	2	34	92,000	0	7,200	0
4,4'-DDE	µG/KG	4.2	22	35	62,000	0	5,100	0
4,4'-DDT	µG/KG	3.4	17	34	47,000	0	7,000	0
Alpha-Chlordane	µG/KG	2	4	34	24,000	0		
Dieldrin	µG/KG	3.2	14	34	1,400	0	110	0
Endosulfan I	µG/KG	55	21	35	200,000	0		
Endosulfan II	µG/KG	0.88	1	34	200,000	0		
Endrin	µG/KG	3.6	1	34	89,000	0	180,000	0
Endrin ketone	µG/KG	0.58	1	34	NA	0		
Gamma-Chlordane	µG/KG	1.1	3	34	NA	0		
Methoxychlor	µG/KG	45	1	34	NA	0	3,100,000	0
Inorganics								
Aluminum	MG/KG	27,900	97	97	NA	0	990,000	0
Antimony	MG/KG	5.1	32	97	NA	0	410	0
Arsenic	MG/KG	12.6	97	97	16	0	1.6	97
Barium	MG/KG	365	97	97	400	0	190,000	0
Beryllium	MG/KG	1.2	95	97	590	0	2,000	0
Cadmium	MG/KG	1,100	77	95	9.3	11	800	1
Calcium	MG/KG	193,000	96	97	NA	0		
Chromium	MG/KG	446	97	97	1,500	0		
Cobalt	MG/KG	26.8	97	97	NA	0	300	0
Copper	MG/KG	7,310	97	97	270	52	41,000	0
Cyanide	MG/KG	0.7	2	16	27	0	20,000	0
Iron	MG/KG	118,000	97	97	NA	0	720,000	0
Lead	MG/KG	998	97	97	1,000	0	800	1
Magnesium	MG/KG	15,000	97	97	NA	0		
Manganese	MG/KG	5,040	97	97	10,000	0	23,000	0
Nickel	MG/KG	59.3	92	92	310	0	20,000	0
Potassium	MG/KG	4,880	76	76	NA	0		
Selenium	MG/KG	0.92	4	97	1,500	0	5,100	0
Silver	MG/KG	205	66	97	1,500	0	5,100	0
Sodium	MG/KG	213	81	97	NA	0		
Thallium	MG/KG	0.27	6	97	NA	0	10	0
Vanadium	MG/KG	41.9	97	97	NA	0	5,200	0
Zinc	MG/KG	1,470	92	92	10,000	0	310,000	0
Mercury	MG/KG	9.1	96	97	2.8	49	310	0

Notes:

1) Criteria values are the NYSDEC commerical SCOs (6 NYCRR Subpart 375-6).

2) Criteria values are the EPA Industrial RSL (June 2011).

Table 1-2
Summary of Ditch Soil Data
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Criteria Value[1]	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed
Explosives						
2,4,6-Trinitrotoluene	UG/KG	120		0	1	4
2,4-Dinitrotoluene	UG/KG	83		0	1	4
2-amino-4,6-Dinitrotoluene	UG/KG	260		0	1	4
RDX	UG/KG	210		0	1	4
Tetryl	UG/KG	140		0	1	4
Semivolatile Organic Compounds						
Benzo(a)anthracene	UG/KG	32	5,600	0	2	4
Benzo(a)pyrene	UG/KG	37	1,000	0	2	4
Benzo(b)fluoranthene	UG/KG	37	5,600	0	2	4
Benzo(ghi)perylene	UG/KG	48	500,000	0	1	4
Benzo(k)fluoranthene	UG/KG	28	56,000	0	2	4
Chrysene	UG/KG	50	56,000	0	3	4
Di-n-butylphthalate	UG/KG	25		0	1	4
Fluoranthene	UG/KG	60	500,000	0	3	4
Hexachlorobenzene	UG/KG	40	6,000	0	2	4
Indeno(1,2,3-cd)pyrene	UG/KG	32	5,600	0	1	4
Naphthalene	UG/KG	24	500,000	0	1	4
Phenanthrene	UG/KG	34	500,000	0	3	4
Pyrene	UG/KG	110	500,000	0	3	4
Pesticides/PCBs						
4,4'-DDE	UG/KG	12	62,000	0	2	4
Aldrin	UG/KG	2.2	680	0	1	4
Alpha-Chlordane	UG/KG	5.7	24,000	0	1	4
Aroclor-1254	UG/KG	580	1,000	0	2	4
Dieldrin	UG/KG	7.4	1,400	0	1	4
Endosulfan I	UG/KG	2.7	200,000	0	2	4
Endrin aldehyde	UG/KG	3.2		0	1	4
Inorganics						
Aluminum	MG/KG	35,000		0	4	4
Arsenic	MG/KG	16.1	16	1	4	4
Barium	MG/KG	308	400	0	4	4
Beryllium	MG/KG	1.4	590	0	4	4
Cadmium	MG/KG	25.6	9	2	4	4
Calcium	MG/KG	84,400		0	4	4
Chromium	MG/KG	48.4		0	4	4
Cobalt	MG/KG	19.7		0	4	4
Copper	MG/KG	814	270	2	4	4
Iron	MG/KG	50,500		0	4	4
Lead	MG/KG	101	1,000	0	4	4
Magnesium	MG/KG	10,200		0	4	4
Manganese	MG/KG	935	10,000	0	4	4
Mercury	MG/KG	5.3	3	2	4	4
Nickel	MG/KG	67.7	310	0	4	4
Potassium	MG/KG	4,680		0	4	4
Silver	MG/KG	5.8	1,500	0	3	4
Sodium	MG/KG	377		0	4	4
Vanadium	MG/KG	53.7		0	4	4
Zinc	MG/KG	755	10,000	0	4	4

Notes:
1) Criteria values are the NYSDEC commerical SCOs (6 NYCRR Subpart 375-6).

Table 1-3
Summary of Groundwater Data
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Parameter	Unit	Maximum Value	Criteria Source[1]	Criteria Level	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed
Volatile Organic Compounds							
Tetrachloroethene	µG/L	1	GA	5	0	1	8
Semivolatile Organic Compounds							
Bis(2-Ethylhexyl)phthalate	µG/L	33	GA	5	4	4	8
Explosives							
1,3-Dinitrobenzene	µG/L	0.067	GA	5	0	1	8
HMX	µG/L	0.5				1	8
Inorganics							
Aluminum	µG/L	63,300				9	12
Antimony	µG/L	52.1	GA	3	7	7	12
Arsenic	µG/L	9.5	MCL	10	0	3	12
Barium	µG/L	751	GA	1,000	0	12	12
Beryllium	µG/L	5	MCL	4	1	3	12
Cadmium	µG/L	3.8	GA	5	0	4	12
Calcium	µG/L	660,000				12	12
Chromium	µG/L	106	GA	50	1	5	12
Cobalt	µG/L	94.4				4	12
Copper	µG/L	123	GA	200	0	7	12
Iron	µG/L	113,000	GA	300	5	10	12
Iron+Manganese	µG/L	117,640	GA	500	6	12	12
Lead	µG/L	75.6	MCL	15	2	8	12
Magnesium	µG/L	77,900				12	12
Manganese	µG/L	4,640	GA	300	4	12	12
Mercury	µG/L	1.8	GA	0.7	1	3	12
Nickel	µG/L	209	GA	100	1	5	12
Potassium	µG/L	18,700				9	12
Selenium	µG/L	2.5	GA	10	0	5	12
Silver	µG/L	4.6	GA	50	0	2	12
Sodium	µG/L	40,000	GA	20,000	1	12	12
Thallium	µG/L	3.4	MCL	2	1	1	12
Vanadium	µG/L	93.1				3	12
Zinc	µG/L	321				12	12

Notes:
1) Criteria action level source document and web address.
- The NYS GA Standard and EPA MCL values were obtained from the provided links.
http://water.epa.gov/drink/contaminants/index.cfm#List

Table 1-4
Summary of Surface Water Data
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Parameter	Unit	Maximum Value	Criteria Level[1]	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed
Explosives						
HMX	UG/L	0.49			2	4
RDX	UG/L	2			2	4
Inorganics						
Aluminum	UG/L	37,500		0	4	4
Arsenic	UG/L	2.3	360	0	1	4
Barium	UG/L	439			4	4
Beryllium	UG/L	1.5		0	2	4
Cadmium	UG/L	11.2		0	1	4
Calcium	UG/L	194,000			4	4
Chromium	UG/L	50.8	4270	0	3	4
Cobalt	UG/L	18.2		0	2	4
Copper	UG/L	612	50	3	4	4
Cyanide	UG/L	47.7	22	1	1	4
Iron	UG/L	60,400	300	4	4	4
Lead	UG/L	68.7	330	0	4	4
Magnesium	UG/L	24,300			4	4
Manganese	UG/L	1,250			4	4
Mercury	UG/L	3			4	4
Nickel	UG/L	74.2	4250	0	4	4
Potassium	UG/L	9,670			4	4
Sodium	UG/L	4,340			4	4
Vanadium	UG/L	54.9	190	0	3	4
Zinc	UG/L	883	800	1	4	4

Notes:
1) Criteria source are the NYS AWQS Class D Values.

2.0 REMEDIAL ACTION OBJECTIVES

The purpose of this section is to develop RAOs and general response actions for each medium of interest identified at the OD Grounds. Based on the RAO and the general response actions, potential remedial technologies are identified and screened in **Section 2.0** and **3.0**, and a detailed analysis of remedial action alternatives is provided in **Section 4.0**. This process follows the USEPA and NYSDEC method of identifying and screening technologies/processes and consists of the following six steps:

- Develop RAOs that specify media of interest, chemical constituents of concern, exposure pathways, and preliminary remediation goals that permit a range of treatment and containment alternatives to be developed. The preliminary remediation goals will be based on chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) and the results of the HHRA and the MEC Hazard Assessment (**Section 2.0**);
- Develop general response actions for each medium of interest that will satisfy each remedial action objective for the OD Grounds (**Section 2.0**);
- Identify estimates of volumes or areas, to the extent practical, of media to which general response actions might be applied (**Section 2.0**);
- Identify remediation technologies/processes associated with each general response action. Screen and eliminate technologies/processes based on technical implementability (**Section 2.0**);
- Evaluate technologies/processes and retain processes that are representative of each technology (**Section 2.0**); and
- Assemble and further screen the retained technologies/processes into a range of alternatives as appropriate (**Section 3.0** and **4.0**).

2.1 GENERAL REMEDIAL ACTION OBJECTIVES

As discussed in **Section 1**, the ESI, OE EE/CA, the munition response actions, and the 2010 supplemental work conclude that further actions are warranted for the OD Grounds. Based on the previous investigations and the proposed future site use, soil was identified as a medium of interest. RAOs address the goals for reducing the potential MPPEH and/or soil contamination hazards to ensure protection of human health, safety and the environment (USEPA, 1988). The RAOs are intended to be as specific as possible, but not so specific that the range of alternatives that can be developed is unduly limited. The intent of this FS is to select RAOs that are protective of human health and the environment for evaluation and that achieve an acceptable minimum level of risk at the OD Grounds. The future use for the OD Grounds is passive recreation/conservation for walking and hiking activities. There will be no intrusive soil activities such as digging, camping, camp fires, tent staking, trail construction, playgrounds, etc. Therefore, the presence of potential MPPEH and/or soil contamination results in the potential for human receptors to come into contact with potential MPPEH and/or soil contamination in the OD Grounds.

The overall objective of any remedial response is to protect human health and the environment. RAOs have been developed to meet this overall objective. The objectives are then used as a basis for developing remedial alternatives.

CERCLA, as amended by SARA of 1986, requires that a CERCLA remedial action:

- At minimum, attain federal and more stringent state ARARs on completion of the remedial action for on-site remedial actions (unless an ARAR waiver becomes necessary).
- Use remedial alternatives that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances;
- Select remedial actions that protect human health and the environment, are cost effective, and involve permanent solutions, alternative solutions, and resource recovery technologies to the maximum extent possible;
- Avoid off-site transport and disposal of untreated hazardous substances or contaminated materials where practical technologies exist to treat these materials on-site.

The National Contingency Plan (NCP) regulations, which implement CERCLA, generally require ARAR compliance during remedial actions as well as at completion (40 CFR 300.435(b)(2)). However, a no-action decision does not require compliance with ARARs.

The RAOs for the OD Grounds consist of media specific objectives designed to be protective of human health and the environment. Where applicable, consideration was given to the NCP preference for permanent solutions. The general RAOs for the OD Grounds are as follows:

- Prevent public or other persons from direct contact with MEC or MPPEH, direct contact with soil, or inhalation of MC that may present a health risk due to potential contamination from MC. NYSDEC Commercial SCOs were determined to be an appropriate and acceptable contaminant level for protection of human health and the environment.
- Restore the area to a condition that would comply with the SEDA LRA determination that the future use of the OD Grounds would be for passive recreation/conservation where contact with the soil is not likely (i.e., would not include playgrounds, ballparks, camping). LUCs and compliance with proposed RAOs.

The investigation and remediation of the OD Grounds is subject to pertinent requirements of both federal environmental statutes or regulations (generally administered by EPA Region II for SEDA) and the State of New York environmental statutes and regulations (generally administered by the NYSDEC), determined in accordance with the CERCLA ARAR process. ARARs are promulgated standards that may be applicable to the site cleanup process after a remedial action has been selected for implementation.

Any standard, requirement, criterion, or limitation under any federal environmental or state environmental or facility siting law may be either applicable or relevant and appropriate to a specific action. The only state laws that may become ARARs are those promulgated, and identified timely by the state, such that they are legally enforceable and generally applicable and equivalent to or more stringent than federal laws. A determination of applicability is made for the requirements as a whole, whereas a determination of relevance and appropriateness may be made for only specific portions of a requirement. An action must comply with relevant and appropriate requirements to the same extent as an applicable requirement with regard to substantive conditions, but need not comply with the administrative conditions of the requirement.

Three categories of potentially applicable state and federal requirements were reviewed: (1) chemical-specific, (2) location-specific, and (3) action-specific. Chemical-specific ARARs address certain contaminants or class of contaminants and relate to the level of contamination allowed for a specific pollutant in various environmental media. Location-specific ARARs are based on the specific setting and nature of the site. Action-specific ARARs relate to specific actions proposed for implementation at a site. Both location-specific and action-specific ARARs are independent of the media. In addition to ARARs, advisories, criteria, or guidance may be evaluated as TBC. The NCP provides that the TBC category may include advisories, criteria, or guidance that were developed by EPA, other federal agencies, or states that may be useful in devising CERCLA remedies. These advisories, criteria, and guidance are not promulgated and, therefore, are not legally enforceable standards such as ARARs.

2.2 POTENTIAL CHEMICAL-SPECIFIC ARARS AND TBCS

Chemical-specific ARARs are usually health-based or risk-based numerical values or methodologies, established by promulgated standards, that are required to be used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment. Chemical-specific TBCs can serve to indicate contaminant levels that may merit concern.

Potential federal and state chemical-specific ARARs and TBCs considered in connection with the FS at the OD Grounds are described in the following sections.

2.2.1 Soil

Cleanup levels for hazardous constituents in soil have been proposed by NYS surface and subsurface soil chemical exceedances of NYSDEC Subparts 375-1 through 375-4 and Subpart 375-6 under 6 NYCRR Part 375 - Environmental Remediation Programs. 6 NYCRR Subpart 375-6, effective December 2006, includes the SCO tables developed for five categories of future land use (i.e., unrestricted use, residential, restricted-residential, commercial, and industrial). As the OD Grounds is located in the future recreational area, the NYSDEC SCOs for commercial use scenario are considered to be relevant and appropriate criteria for the Site.

USEPA RSLs for soil are considered TBCs for this FS.

2.3 POTENTIAL LOCATION-SPECIFIC ARARS

Location-specific ARARs may serve to limit contaminant concentrations, or even to restrict or to require some forms of remedial action in environmentally or historically sensitive areas at a site, such as natural features (including wetlands, flood-plains, and sensitive ecosystems) and manmade features (including landfills, disposal areas, and places of historic or archaeological significance). These ARARs generally restrict the concentration of hazardous substances or the conduct of activities based solely on the particular characteristics or location of the site.

Potential federal and state location-specific ARARs considered in connection with this response action include the following:

Federal:

- Executive Orders 11593, Floodplain Management (May 24, 1977), and 11990, Protection of Wetlands (May 24, 1977).
- Clean Water Act (CWA), Section 404, and Rivers and Harbor Act, Section 10 (requirements for Dredge and Fill Activities) and the associated regulations (i.e. 40 CFR part 230).
- Wetlands Construction and Management Procedures (40 CFR part 6, Appendix A).

Based on the OD Grounds conditions and the land use determination, further consideration of these location-specific ARARs does not appear warranted at this time.

2.3.1 Action-Specific ARARs

Action-specific ARARs are usually technology or activity-based requirements or limitations that control actions involving specific substances. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the development of all response action alternatives. Note that regulations that are not related to environmental law or do not govern activities that take place at the CERCLA site are not considered ARARs.

No action-specific regulations were identified in connection with this response action. Based on the OD Grounds conditions, further consideration of these action-specific ARARs does not appear warranted at this time.

2.4 SITE-SPECIFIC CLEANUP GOALS

Remedial action at the OD Grounds is guided by the cleanup goal of preventing direct contact by receptors with MEC and with MC. These cleanup goals will have the effect of protecting human health and the environment, complying with ARARs, and meeting all other RAOs.

Table 2-1 OD Grounds Remedial Action Objectives

Media	Contaminant of Concern	Receptor	Exposure Route	Remedial Action Objective	Applicable ARAR/TBCs[1]
Soil	MC	Human (Current and Future Site Visitors, Recreational Users)	Incidental ingestion, dermal contact, inhalation	Prevent direct contact with soil, or inhalation of MC by receptors.	NYSDEC Commercial SCOs
Soil	MEC	Human (Current and Future Site Visitors, Recreational Users)	Physical Access to Site	Prevent direct contact with MEC by receptors	Removal of MEC to the extent practicable.
Not Applicable (N/A)	N/A	Human (Current and Future Site Visitors, Recreational Users)	N/A	Restore the area to a condition that would comply with the SEDA LRA determination that the future use of the OD Grounds would be for recreation/conservation.	N/A

(1) ARARs and TBCs are described in Subchapter 2.1 of this report.

2.5 GENERAL RESPONSE ACTIONS

General response actions are selected to satisfy the RAOs for each medium of concern at the project site. Identification of the general response actions also includes identification of ARARs. General response actions are those actions that will achieve the identified RAOs and may include treatment, containment, excavation, extraction, disposal, LUCs, or some combination of any or all of these. This subchapter describes the general response actions applicable to the OD Grounds. The general response actions identified include the following:

- No Action
- Hazard Management – LUCs (e.g., access restrictions [fencing and signage], activity restrictions, education, or deed notification)
- Remedial Action (Mapping, excavation, disposal, engineering controls, restoration) – MEC removal through geophysical mapping and excavation, soil excavation, MEC disposal, soil capping, site restoration

With the exception of the No Action alternative, the general response actions identified above may be combined in developing remedial action alternatives for the project site. Some areas may exhibit a higher MEC density and a correspondingly greater potential for MEC hazards so it may be appropriate to apply a different response action or combination of response actions in different parts of the site.

The No Action alternative refers to a site remedy where no active remediation or enforceable LUCs are implemented. Under CERCLA, evaluation of a No Action alternative is required, pursuant to the NCP (42 CFR 300.430 et seq.), to provide a baseline for comparison with other remedial technologies and alternatives.

Hazard management technologies include enforceable administrative institutional controls and/or physical measures (engineering controls) to prevent or limit exposure of receptors to MEC or MC. A deed notice/environmental easement is an example of an institutional control. Physical barriers and access restrictions (e.g., fencing, locked gates, and warning signs) or activity restrictions (prohibiting intrusive activities) are examples of engineering controls. LUCs can be cost-effective, reliable, and immediately effective, and can be implemented either alone or in conjunction with other remedial components. Inspections and monitoring typically are required to document long-term effectiveness of LUCs. The administrative feasibility of and cost to implement LUCs depend on site-specific circumstances (e.g., whether or not a site is under the direct operational control of the DoD, or has been transferred to non-federal ownership).

A remedial action alternative may employ technologies to reduce the toxicity, mobility, or volume (TMV) of contaminants in the subsurface, thereby preventing or minimizing exposure of receptors to MEC or chemical contamination that could pose an unacceptable MEC hazard or HTW risk. Physical extraction methods are typically used to remove surface and subsurface MEC for disposal. The feasibility and cost to implement MEC excavation options can vary widely based on site-specific conditions and circumstances. Examples of remedial action approaches include removal of soil and/or MEC by hand, implementation of an engineered cover, or excavation and off-site disposal.

2.6 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

Remedial action technologies and processes were identified for consideration as possible remedial options at the OD Grounds. The list of technologies and processes presented was developed from several sources including standard engineering handbooks, vendor information, and best engineering estimates.

2.6.1 MEC

2.6.1.1 Detection Technologies for MEC/MPPEH

The selection of the best technology depends on the properties of the MEC to be located, including whether the ordnance is found on the surface or below the surface, and the characteristics of the area where the MEC is located, such as soil type, topography, vegetation, and geology.

Detection technologies have two basic forms. One form, visual searching, has been successfully used on a number of sites where MEC is located on the ground surface. When performing a visual search of a site, the area to be searched is divided into five-foot lanes, which are then systematically inspected for MEC. A metal detector is sometimes used to supplement the visual search in areas where ground vegetation may conceal MEC. Typically, any MEC found during these searches is flagged or marked on a grid sheet for later removal.

The other form of MEC detection, geophysics, includes a family of detection instruments designed to locate MEC. This family of instruments includes magnetic instruments, electromagnetic instruments, and ground penetrating radar. Each piece of equipment has its own inherent advantages and disadvantages based on its operating characteristics, making the selection of the type of geophysical instrument paramount to the survey success. Nevertheless, geophysics is the most cost-effective method of conducting subsurface MEC surveys. The equipment designed for MEC geophysical surveys is lightweight, easily maintained, and very effective. However, there are limitations to geophysics.

MEC can be readily detected at the site using geophysical techniques. The handheld flux-gate magnetometers (i.e., Schonstedt GA-52CX) have been successfully used to “mag and dig” around buildings and structures where the EM61 suffers more from interference. Use of the handheld magnetometers can also be indicated by terrain where the ground surface (e.g., sloped or wooded terrain) may not be conducive to use of an EM61. A high degree of confidence should be expected for successful detection with these methods. However, it should be noted that there are limitations to their detection capabilities such as the depth of detection and interference from utilities, structures, and other metal in the vicinity. Time-domain electromagnetic induction metal detectors (i.e., Geonics EM61–MK2) can also be successfully used for digital geophysical mapping (DGM) at areas of the site. Although these geophysical instruments can be successful in finding MEC, only a percentage of the anomalies identified result in actual MEC.

Geophysical equipment cannot usually distinguish MEC items from other metallic objects located below the surface. “Cultural interference,” such as underground utility lines, construction debris, or metal bearing rock, can produce a signature to the equipment similar to MEC. Therefore, it is necessary for the geophysical survey team to carefully document any known cultural interference prior to beginning the survey. Another limitation to the equipment is that metallic objects have to be larger when at greater depths so that the geophysical equipment can obtain a reading. The use of geophysical equipment and surveys has proven to be one of the most cost effective methods currently available to detect subsurface MEC. At the OD Grounds, it will be most effective to use handheld flux-gate magnetometers in wooded or inaccessible terrain and to use an EM61 for DGM in the open areas that require the detection of potential MPPEH.

2.6.1.2 Removal Technologies for MEC/MPPEH

Once a site has been surveyed by either visual or geophysical means, the recovery of MEC/MPPEH can begin. MEC recovery operations can take the form of a surface-only clearance, an intrusive (subsurface) clearance, or a combination of the two methods. The decision on the appropriate level of clearance operation is based on the nature and extent of the MEC contamination as well as the intended future use of the site. Removal technologies include hand excavation and mass excavation (using heavy equipment). Hand excavation is considered the industry standard for MEC recovery and can be done very thoroughly. Hand excavation was conducted during previous investigations at the OD Grounds. Construction support would include UXO personnel to provide sweeps to detect MEC prior to any planned construction.

During a surface clearance operation exposed MPPEH items are identified during the detection phase. The MEC items are then inspected, collected (if possible), and transported to a designated area for cataloging and eventual disposal. If it is determined during the MPPEH inspection that the item cannot be safely moved it may be necessary to destroy the MPPEH item in place.

During a subsurface clearance operation subsurface MPPEH identified by the geophysical survey or other detection methods require excavation for removal. The excavation of the MPPEH item then takes place with either hand tools or mechanical equipment depending on the suspected depth of the object. Once the item has been exposed, it is then inspected, collected (if possible), and transported to a designated area for cataloging and disposal. If it is determined during the inspection that the item cannot be safely moved, it will be destroyed in place.

Evacuations are sometimes necessary when conducting intrusive investigations to minimize the risk of the operation. An evacuation area is calculated by USACE based on the potential explosive force that could be encountered during an excavation. An evacuation distance is then calculated to ensure that all non-essential personnel are outside of that distance during the excavation process. Engineering controls can be developed to reduce this evacuation distance; however, evacuations may be required if excavations take place close to any inhabited areas and engineering controls cannot be developed to reduce the exclusion zone to preclude the need to evacuate. Every possible option will be explored to minimize potential evacuations with the exception of compromising public safety. Due to the remoteness of SEDA, it is unlikely that evacuations will be necessary during MEC clearance activities.

At the OD Grounds it is anticipated that hand digging will be used to remove MPPEH in areas at most of the site (i.e., Kickout area – 1,000 to 2,500 foot radius). In areas of the Site close to the OD Hill, it may be more efficient to use mechanical excavation equipment and consolidate impacted soil.

2.6.1.3 Disposal Technologies for MEC

Disposal technologies include blow in place (BIP) and 'consolidate and blow.' For BIP, each munition is individually destroyed; whereas, the consolidated shot can be used for munitions that are "acceptable to move." The decision regarding which of these techniques to use is based on the risk involved in employing the disposal option, as determined by the specific area's characteristics and the nature of the MEC items recovered.

A countercharge can be used to destroy the MEC item or the MEC item can be thermally treated as a means of destruction. Engineering controls, such as sandbag mounds and sandbag walls over and around the MEC item, are often used to minimize the blast and fragmentation effects when an MEC item is destroyed in this manner.

In some instances it is determined that an MPPEH item must be destroyed in-place. This technique is typically employed when the item cannot be safely moved to a remote location. This procedure utilizes techniques similar to those described above that will detonate the MEC item or apply sufficient pressure and heat to neutralize the hazard. When this technique is employed, engineering controls such as sandbag mounds and sandbag walls over and around the MEC item are often used to minimize the blast effects.

2.6.1.4 Engineering Controls for MEC

Engineering controls for MEC would include such measures as installing an impermeable earth cover over the contaminated area to prevent contact with MEC. Such a cover would typically be installed after a surface clearance had been conducted, and LUCs (e.g., access and activity restrictions) would be implemented in conjunction the cover.

2.6.2 Technologies for Soil Remediation

Table 2-2 shows the remedial action processes arranged according to categories for general response actions for soil/debris at the OD Grounds and provides the basis for screening out of the various technologies/processes. This table indicates which technologies/processes were retained for further evaluation in Section 3.0.

2.6.2.1 Excavation: Earthmoving/Excavation

Removal of soils can be accomplished using standard mechanical technologies. Armored and unarmored heavy equipment such as backhoes, excavators, front-end loaders, scrapers, bulldozers, and draglines are commonly used for the mechanical excavation of soils. Because the soil at the OD Grounds is readily accessible and can be easily removed using standard mechanical excavation techniques, this technology was retained for further consideration. In the Kickout area, hand digging (activity associated with the MPPEH/MD removal) may be sufficient to remove the potential MEC. After the excavation, the MEC/MPPEH will be disposed of in a designated demolition area and soil may be backfilled (as necessary) to the excavated areas. Similarly, the removal of impacted soil through the use of standard mechanical excavation techniques was retained as a potential soil remediation technology.

Off-site disposal involves the certification that the material is free of MPPEH, consolidation of Material Documented as Safe (MDAS) and the affected soils into separate containers, and transportation off-site. This technology decreases continued on-site exposure to potential MPPEH and MC by receptors. MDAS would be recycled or melted off-site. Off-site disposal of contaminated soils is preferable when on-site disposal is precluded or limited by site characteristics, when unimpaired future use of the site is a high priority, and when the volume for disposal is too small to warrant construction of a landfill. A permitted, off-site RCRA Subtitle D facility with the capacity and capability to handle the disposal material must be identified.

2.6.2.2 Capping and Containment Technologies

Capping involves placing a barrier over the impacted area to prevent contact (i.e. exposure to subsurface soil via direct contact and dust inhalation) with human and ecological receptors, and surface water runoff. Two single component cap options that are available to unlined landfill facilities consists of either a low permeability soil (LPS) cap or a geomembrane cap. The soil layer below the geomembrane will made free of sharp rocks and stones, to prevent damage to the overlying geomembrane to the possible extent. Remedial method may include 12-inches of sand above the geomembrane to promote drainage off of the cap, while also providing cap protection. A layer of sand could potentially be substituted by a geocomposite drainage layer and with 18 inches of select subsoil used. Six inches of topsoil would complete the protective layer to a total thickness of 18 inches. A non-woven geotextile fabric may be installed between the top soil and sand drainage layer if required. As required, surface and subsurface drainage will be controlled by swales or cap drains, respectively. These aspects are variable, depending on the relative geotechnical properties of each soil type used for the drainage layer and the top soil. Approximately 10 acres of the OD Hill area would be expected to be capped, covering approximately 75,000 cy of material. This capping/containment method would be effective in reducing the potential exposure to potential metallic debris and metals contaminated soil, and therefore has been retained for further consideration.

Table 2-2 OD Grounds Feasibility Study – Technology Screening

General Response Action	Primary Remedial Technology	Process Options	Screening	Evaluation			
			Technically Implementable?	Effectiveness	Implementability	Cost	Retained for Consideration?
No Action	None	None	N/A[1]	Effectiveness at achieving RAOs would not be demonstrated. Utilized as baseline for alternative comparison.	Readily implementable	No Cost	Yes
Hazard Management	Land Use Controls / Institutional Controls	Access Restrictions (fencing, signage)	Yes	Potentially effective in meeting RAOs.	Readily implementable.	Negligible cost. (Low capital, low maintenance.)	Yes
		Activity Restrictions (e.g., no intrusive activities allowed)	Yes	Potentially effective in meeting RAOs.	Readily implementable.	Negligible cost. (Low capital, low maintenance.)	Yes
		Deed Notice	Yes	Potentially effective in meeting RAOs.	Readily implementable.	Negligible cost. (Low capital, low maintenance.)	Yes
Remedial Action	MEC or Soil Removal	Hand Excavation	Yes	Potentially effective in meeting RAOs.	Readily implementable in most areas of Site	Moderate capital, no O&M.	Yes
	MEC or Soil Removal	Heavy Equipment Excavation	Yes	Potentially effective in meeting RAOs.	Reasonably implementable with coordination	Moderate capital, no O&M.	Yes
	Engineering Controls	Install soil cap[2]	Yes	Potentially effective in meeting RAOs.	Readily implementable	Moderate capital, low O&M.	Yes
	MEC or Soil Disposal	Soil disposal off-site (after MEC risks removed)	Yes	Potentially effective in meeting RAOs.	Readily implementable in most areas of Site	High capital, no O&M.	Yes

(1) Evaluation of the No-Action alternative is required to provide a baseline for comparison with other remedial technologies and alternatives; the No Action alternative is retained for further consideration throughout the FS.
(2) Engineering controls such as installation of an impermeable cover would need to be implemented in conjunction with LUCs (e.g., access and activity restrictions).

2.6.3 Land Use Controls (LUCs)

Risk and hazard management technologies include enforceable administrative institutional controls and/or physical measures (engineering controls) to prevent or limit exposure of receptors to MEC or MC. Deed notices, zoning ordinances, special use permits, and restrictions on excavation are examples of institutional controls. Physical barriers and access restrictions (e.g., fencing, locked gates, and warning signs) or activity restrictions (prohibiting intrusive activities) are examples of engineering controls. LUCs can be cost-effective, reliable, and immediately effective, and can be implemented either alone or in conjunction with other remedial components. Inspections and monitoring typically are required to document long-term effectiveness of LUCs. The administrative feasibility of and cost to implement LUCs depend on site-specific circumstances (e.g., whether or not a site is under the direct operational control of the DoD, or has been transferred to non-federal ownership).

2.6.4 Evaluation of Technologies

In the CERCLA process, the alternatives described above must be analyzed and screened against the three general categories of effectiveness, implementability, and cost to ensure that they meet the minimum standards of the criteria within each category. This screening will be performed for the alternatives chosen as possibilities at the OD Grounds. The three general categories are described below along with the specific evaluation criteria contained within each of the categories.

The effectiveness of an alternative refers to its ability to meet the clean-up objective within the scope of the response action. The effectiveness category is divided into four evaluation criteria. These include Overall Protection of Public Safety and the Human Environment; Compliance with ARARs; Long-Term Effectiveness; and Short-Term Effectiveness.

The implementability category includes the technical and administrative feasibility of implementing an alternative, the availability of various services and materials required during its implementation, and the acceptance local residents and agencies have expressed towards the various alternatives. The implementability category is divided into six evaluation criteria including: Technical Feasibility; Administrative Feasibility; Availability of Services and Materials; Property Owner Acceptance; Local Agency Acceptance; and Community Acceptance.

Finally, each alternative is evaluated to determine its projected overall implementation cost. Each of the evaluation criteria introduced above will be discussed in greater detail in Section 3.

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

3.1 INTRODUCTION

This section summarizes the remedial action alternatives that were developed from the technologies screened in **Section 2.0**. Prior to the development of alternatives, an evaluation of general response actions and a technology screening was performed for inclusion into proposed remedial action alternatives for the OD Grounds. Technologies were combined into alternatives considering potential waste-limiting and site-limiting factors unique to the OD Grounds and the level of technical development for each technology. This information was used to differentiate alternatives with respect to effectiveness and implementability. This FS focuses on identifying and evaluating alternatives for the OD Grounds.

3.2 DESCRIPTION OF ALTERNATIVES

The following remedial action alternatives were developed for the OD Grounds:

- Alternative 1: NFA
- Alternative 2: Geophysical mapping, intrusive investigation, capping, LUCs; and
- Alternative 3: Geophysical mapping, intrusive investigation, excavation, off-site disposal, and LUCs.

Technologies and processes associated with these actions were assembled into remedial action alternatives.

3.2.1 Alternative 1, No-Further Action

Alternative 1 is the no further action alternative. CERCLA and NYSDEC guidance for conducting feasibility studies recommends that the no-action alternative be considered against all other alternatives.

The no further action alternative would leave the OD Grounds undisturbed with the continuation of existing site security measures, such as locked gates, to prevent civilian access and direct contact with contaminated soil and possible exposure to potential MPPEH.

3.2.2 Alternative 2, Geophysical Mapping/Intrusive Investigation/Capping/LUCs

This alternative would complete the MPPEH clearance in areas that were not previously cleared by previous investigations. In the open and accessible areas, previously identified anomalies will be reacquired and removed. In areas that are wooded or inaccessible and were not previously cleared, mag and dig operations will be completed using a handheld magnetometer, such as a Schonstedt. In accessible areas that were not previously mapped (0 – 1,000 foot radius), DGM surveys will be conducted using EM61s over approximately 60 acres in the area surrounding the OD Hill.

It is anticipated that impacted soil will be encountered in areas located closer to the OD Hill (0 – 500 foot radius). At locations where the DGM survey indicates that there is impacted soil, the soil will be excavated. The impacted soil will be consolidated and incorporated under the site cap. The excavated area will then be resurveyed, and the results of the DGM survey will be used to demonstrate that any impacted soil is contained under the cap. For less impacted soil, the anomalies from the DGM surveys will be reacquired and intrusively investigated by a geophysicist and UXO dig team, in the same manner as the previous intrusive investigation in the Kickout area. A two-person UXO technician / demolition team will perform any required MPPEH demolition procedures. The demolition team will dispose of any MPPEH suspected of containing explosives/spotting charges or inaccessible voids by detonation. All MD will be certified and disposed of as MDAS in accordance with current regulations.

The non-impacted excavated soil will be placed on the OD Hill and the resulting surface will be compacted and graded. An engineered cap, covering approximately 10 acres in aerial extent and approximately 75,000 cy (+/- 35%) of material, will be installed over the OD Hill and the surrounding area. The cap will comply with NYS Part 360-2.13 requirements. A geomembrane layer will be selected, and the total thickness of the cap will be at least 18 inches. Any identified soil with contaminant levels exceeding the selected soil cleanup goals would be incorporated under the cap. Soil outside the cap will be tested for compliance with SCOs. A design work plan will be prepared and the exact limits of the cap (and volume incorporated under the cap) will be determined during the design phase of the project.

LTM would include maintenance of the cap and LUC inspections. LUCs will be placed on the site to prohibit the use of groundwater, prohibit digging, and prevent the use of the site as a daycare or for residential activities. Access to and use of the groundwater will be restricted at the OD Grounds under the terms of the future ROD. The groundwater is not being used, and will not be used, as a potable water source. Currently, a non-groundwater sourced municipal water supply is available for SEDA. Subsequent to the remedial action, a groundwater sampling event will be conducted to confirm that the groundwater was not negatively impacted as a result of the remedial action.

Implementation of this alternative would be highly effective in achieving the RAOs, long-term effectiveness, preventing exposure, and implementability. The costs for this alternative are moderate.

3.2.3 Alternative 3, Geophysical Mapping/Intrusive Investigation/Excavation/Off-Site Disposal/LUCs

The geophysical mapping and intrusive investigation components of Alternative 3 are similar to Alternative 2, but this alternative would involve the excavation and off-site disposal of all soil containing MPPEH or contaminant concentrations that exceed cleanup goals in lieu of capping these soils. Similar to Alternative 2, reacquisition would be completed in the Kickout area. In areas outside of the OD Hill that are wooded or inaccessible and were not previously surveyed, mag and dig operations will be completed using a handheld magnetometer, such as a Schonstedt. In accessible areas that were not previously mapped (0 – 1,000 foot radius), DGM surveys will be conducted using EM61s over approximately 60 acres in the area surrounding the OD Hill. In the area closer to the OD Hill where the DGM survey indicates it is cost effective, impacted soil will be excavated (estimate 15,000 cubic yards). The soil will be mechanically processed to remove MPPEH and the overburden will be staged on-site for potential reuse and/or reincorporation to bring the excavated surface back to its original grade. The excavated area will then be resurveyed and the results of the DGM survey will be used to generate a dig list of target anomalies to be investigated. The anomalies on the generated dig list will be reacquired and intrusively investigated by a geophysicist and UXO dig team, in the same manner as the intrusive investigation in the Kickout area. All MD will be certified and disposed of as MDAS in accordance with current regulations.

In Alternative 3, the OD Hill and the potentially impacted soil immediately surrounding it will be addressed by excavation and off-site disposal. An excavator would excavate the soils, which would then be processed using a screening table (or similar) to ensure the removal of all MPPEH. Prior to disposal, excavated soils will be sampled for RCRA hazardous waste characteristics to include a full Toxicity Characteristics Leaching Procedure (TCLP) analysis (TCLP VOCs, TCLP SVOCs, TCLP pesticides and herbicides, TCLP metals plus ignitability, corrosivity, and reactivity). Soils deemed free from MPPEH and meeting site cleanup standards will be left for potential re-use on-site. Post-excavation confirmatory (in-situ) soil will be sampled for metals by EPA method SW846 6010C. A sampling strategy for the soil within the 0 to 1,000-foot radius, including sample locations and the number of samples, will be detailed in a follow-on document subsequent to MEC clearance activities. Soil remaining on-site outside the cap will be tested for compliance with SCOs.

Upon completion of excavation and confirmatory sampling, the excavated areas would be graded and re-vegetated to promote positive drainage. The disturbed areas would be restored to the natural grade. Soils not appropriate for reuse at the Site (e.g., soils intermixed with debris or above the cleanup standards) will be disposed of at an approved Subtitle D landfill. Trucks will be staged to haul the excavated soil off-site to an approved landfill. Identified MPPEH will be demolished appropriately, as described in Alternative 2.

As in Alternative 2, part of Alternative 3 will include LUCs placed on the site to prohibit the use of groundwater, to prohibit digging, and to prevent the use of the site as a day care or for residential activities. Following the remedial action, a groundwater sampling event will be conducted to confirm that the groundwater was not negatively impacted by the remedial action.

Implementation of this alternative using excavation and off-site disposal would be effective in reducing the on-site toxicity, mobility, and volume of MPPEH and MC at the OD Grounds, and transfer the impact of the overall toxicity and volume to a controlled environment. Approximately 10 acres of the OD Hill are expected to be capped. The associated costs for excavation and off-site disposal are extremely high.

3.3 SCREENING CRITERIA

The alternatives assembled above will be screened for effectiveness, implementability, and cost. This screening process is used to select the most favorable alternatives for a detailed analysis. Although this is a qualitative screening, care has been taken to ensure that screening criteria are applied consistently to each alternative and that comparisons have been made on an equal basis, at approximately the same level of detail. The screening criteria include the following:

- **Effectiveness** – the degree to which an alternative reduces the toxicity, mobility, or volume through treatment; minimizes residual risks; and affords long-term protection.
- **Implementability** – the technical and administrative feasibility of implementing the alternative.
- **Cost** – the costs of construction and any long-term costs to operate and maintain.

- **Reduction of Toxicity, Mobility, or Volume through Treatment** – the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

The detailed analysis and evaluation in Section 4 compare additional criteria for each of the alternatives. Section 4 identifies the most practicable permanent solution as determined by the criteria specified in the NCP (40 CFR 300.430).

No Further Action (Alternative 1) does not implement any remedy to reduce the potential risk; therefore the Alternative does not provide long-term protection of either human health or the environment. Implementation of this alternative does not meet the effectiveness screening criteria. The feasibility and the cost both screen well. Although this alternative does not meet the effectiveness requirements, it is retained for further evaluation for comparative purposes.

Geophysical Mapping/Intrusive Investigation/Capping/LUCs (Alternative 2) would meet the effectiveness criteria for MEC, MPPEH, and soil. The Alternative will minimize exposure to any potential MPPEH by the completion of the intrusive investigation and the installation of the cap. The alternative is effective at reducing the exposure to MPPEH by removing any MPPEH from the site, excavating contaminated soil, and installing a protective cap over soil potentially impacted by metals near the OD Hill. In the case that MEC is identified at the Site, the volume and/or mobility of the MEC would be reduced through intrusive investigation and removal. The implementation of LUCs would be effective at limiting public exposure to any potential contaminants remaining at the Site below the surface. Implementation is administratively and technically feasible, and the skilled labor (e.g., UXO technicians) is readily available to perform this work. The costs to complete this alternative, which are presented in Section 4, are moderate.

Geophysical Mapping/Intrusive Investigation/Excavation/Off-Site Disposal/LUCs (Alternative 3) would meet the effectiveness criteria for MPPEH and soil. This alternative is similar to Alternative 2, with the addition of excavation and off-site disposal of soil from the OD Hill instead of placement beneath a cap. The alternative will minimize exposure to any MPPEH by the completion of intrusive investigation of anomalies outside of the OD Hill and the excavation of soil at the OD Hill. The alternative is effective at reducing the exposure to MPPEH by permanently removing any MPPEH and contaminated soil at the Site. In the case that MEC is identified at the Site, the volume of the MEC would be reduced through intrusive investigation and excavation/off-site disposal. The implementation of LUCs would further be effective at limiting public exposure to any potential subsurface soil contamination remaining at the Site. Implementation is administratively and technically feasible, and the skilled labor (e.g., UXO technicians) is readily available to perform this work. The costs to complete this alternative, which are presented in Section 4, are extremely high due to the excavation, screening, and off-site disposal costs.

4.0 DETAILED ANALYSIS OF RETAINED ALTERNATIVES

4.1 INTRODUCTION

The purpose of the detailed analysis is to evaluate and compare the identified alternatives and present a proposed plan for regulatory agencies and public review. The alternatives identified for the detailed analysis include the following:

- Alternative 1: No Further Action;
- Alternative 2: Geophysical mapping, intrusive investigation, capping, LUCs; and
- Alternative 3: Geophysical mapping, intrusive investigation, excavation, off-site disposal, and LUCs.

The alternatives are compared and evaluated with respect to seven evaluation criteria developed to address the statutory requirements and preferences of CERCLA. The seven criteria are as follows:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
5. Short-term effectiveness
6. Technical and administrative implementability
7. Cost

Two additional criteria, state acceptance and community acceptance of the remedy, can play a role in weighing the balance between remedies that are cost effective and meet other criteria. Public involvement activities help provide an understanding of these factors even though the Proposed Plan has not yet been issued.

The community and state acceptance criteria are based on the degree of assumed acceptance from the local public and from state agencies regarding the implementation of alternatives. These criteria cannot be fully evaluated and assessed until comments on the FS and the Proposed Plan are received.

Each of the three alternatives are analyzed individually against each criterion and then compared against one another to determine their respective strengths and weaknesses and to identify the key trade-offs. The alternative(s) identified as the most practicable solution in reducing the potential MPPEH and soil contamination exposure hazard is selected with respect to each evaluation criteria. The following sections describe each of the evaluation criteria and the evaluation process used for performing the analysis.

4.2 EVALUATION CRITERIA

Alternatives are compared and evaluated with the NCP criteria, including threshold factors, balancing factors, and modifying factors. The following sections describe the factors and each of the criteria.

4.2.1 Threshold Factors

Threshold factors (i.e., protectiveness, compliance with ARARs) are requirements that each alternative must meet or have specifically waived to be eligible for selection.

4.2.1.1 Overall Protection of Human Health and the Environment

The selected alternative must adequately protect human health and the environment from unacceptable risks posed by potential MPPEH. A human health risk assessment was conducted (**Appendix B**) and identified potential risks from exposure to groundwater and risks to potential future residents from soil and groundwater. The selected alternative must prevent exposure to the risks identified in the HHRA. The overall protectiveness to human health and the environment from the threat of MPPEH/MEC was evaluated by completing a MEC HA (**Appendix C**) based on the impact each alternative has on the exposure hazard (MPPEH) and on the environment. Although the potential for human receptors to come into contact with potential MPPEH at the OD Grounds is currently limited, the protectiveness criterion was evaluated in terms of possible human interaction by commercial/industrial workers (e.g., SEDA employees), and/or passive recreational users (e.g., hunters) based on the current and anticipated future land uses at the site. Exposure involves three components: the MPPEH source characteristics, the receptor, and interaction between them. All three components are required for a safety threat from MEC/MPPEH to exist. The protectiveness factor also considers the environmental impact that implementation of an alternative has on the existing environmental/ecological factors at the OD Grounds. **Appendix C** discusses this in more detail.

4.2.1.2 Compliance with ARARs

The NCP requires that all project sites meet ARARs (or that an ARAR waiver be obtained). The ARARs are identified in Section 2.0 of this FS Report. Chemical-specific, location-specific, and action-specific were evaluated. Compliance with the NYS SCOs was identified as a chemical-specific ARAR. The evaluation in Section 2.0 indicates that further evaluation of location-specific and action-specific ARARs is not warranted.

4.2.2 Balancing Factors

Primary balancing criteria (i.e., long-term effectiveness, reduction, short-term effectiveness, implementability, cost) are those that form the basis for comparison among alternatives that meet the threshold criteria. CERCLA requires that alternatives be developed for treating principal threats at the project site through reductions in toxicity, mobility, or volume. In addition, remedies are required to be permanent (e.g., removal of MPPEH or soil contamination) to the maximum extent practicable, and to be cost effective. The five balancing factors described below are weighed against each other to determine which remedies are cost effective and are “permanent” to the maximum extent practicable. The NCP explains that in general, preferential weight is given to alternatives that offer advantages in terms of the reduction of toxicity, mobility, or volume through treatment, and that achieve long-term effectiveness and permanence. However, the NCP also recognizes that some contamination problems will not be suitable for treatment and permanent remedies. The balancing process takes that preference into account, and weighs the proportionality of costs to effectiveness to select one or more remedies that are cost effective.

The final risk management decision in the Decision Document is one that determines which cost-effective remedy offers the best balance of all factors to achieve permanence to the maximum extent practicable.

4.2.2.1 Long-term Effectiveness and Permanence

The permanence criterion evaluates the degree to which an alternative permanently reduces or eliminates the potential for MPPEH or soil contamination exposure hazard. This criterion also evaluates the magnitude of residual risk with the alternative in place, and the effectiveness of controls to manage the residual risk.

4.2.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedies that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

4.2.2.3 Short-term Effectiveness

The short-term effectiveness criterion addresses the potential consequences and risks of an alternative during the implementation phase. Alternatives were evaluated for their effects on human health and the environment prior to the remedy being completed. Short-term risks address adverse impacts to the workers and community during the construction and implementation phases of the remedy.

4.2.2.4 Technical and Administrative Implementability

The technical and administrative implementability criterion evaluates the difficulty of implementing a specific cleanup action alternative. The evaluation includes consideration of whether the alternative is technically possible; availability of necessary on-site and off-site facilities, services, and materials; administrative and regulatory requirements; and monitoring requirements.

4.2.2.5 Cost

The cost criterion evaluates the financial cost to implement the alternative. This includes direct, indirect, and long-term operation and maintenance (O&M) costs (30-year duration). Direct costs are those costs associated with the implementation of the alternative. Indirect costs are those costs associated with administration, oversight, and contingencies. Cost estimates presented are order-of-magnitude level estimates. Based on a variety of information, including productivity estimates (based on site conditions), cost estimating guides, and prior experience at SEDA. The actual costs will depend on true labor rates, actual weather conditions, final project scope, and other variable factors. A present value analysis is used to evaluate costs (capital and operations/maintenance) which occur over different time periods. The total present value (TPV) is the amount needed to be set aside at the initial point in time (base year) to assure that funds will be available in the future as they are needed. A discount rate of 2% was used to estimate TPV per a 2014 update to the Office of Management and Budget (OMB) Circular A-94 for benefit-cost analyses of proposed federal programs, policies, and regulations (OMB, 1992).

4.2.3 Modifying Factors

Community and state acceptance of the remedy can play a role in weighing the balance between remedies that are cost effective and meet other criteria. Public involvement helps to provide an understanding of these factors even though the Proposed Plan has not yet been issued. The community and state acceptance criteria are based on the degree of assumed acceptance from the local public and from state agencies regarding the implementation of alternatives. These criteria cannot be fully evaluated and assessed until comments on the FS and the Proposed Plan are received.

4.3 INDIVIDUAL ANALYSIS OF ALTERNATIVES

4.3.1 Alternative 1 – No Further Action

4.3.1.1 Description

The no further-action alternative would leave the OD Grounds undisturbed with the continuation of existing site security measures, such as locked gates, to prevent civilian access and direct contact with possible exposure to potential MPPEH and soil contamination. Because no remedial activities would be implemented with the NFA alternative, long-term human health and environmental risks for the site essentially would be the same as those represented in the baseline MEC HA (**Appendix C**). Future receptors will be exposed to risks from the pathways described in the HHRA (**Appendix B**).

4.3.1.2 Assessment

Threshold Factors

This alternative does not provide any protectiveness. The ARARs would not be met for the OD Grounds.

Balancing Factors

The no-action alternative includes no controls for exposure and no long-term management measures. All current and potential future risks would continue under this alternative.

This alternative provides no reduction in toxicity, mobility, or volume of MPPEH.

There would be no additional risks posed to workers or the environment as a result of this alternative being implemented.

There are no implementability concerns posed by this remedy, since no action would be taken.

The present worth cost and capital cost of Alternative 1 are estimated to be $0, since there would be no action.

Summary – Alternative 1

Alternative 1 does not reduce the potential exposure hazards. Alternative 1 does not provide overall protection to human health or the environment, as it does not implement a remedy to reduce potential MPPEH or contaminated soil exposure. In addition, there is no reduction in toxicity, mobility, or volume. No costs are associated with this alternative.

4.3.2 Alternative 2 – Geophysical Mapping, Intrusive Investigation, Capping, and LUCs

4.3.2.1 Description

This alternative includes a combination of activities to achieve a reduction in the MEC hazard. In the open and accessible areas, previously identified anomalies with a response greater than 50 millivolts (mV) will be reacquired and removed. In areas that are wooded or inaccessible and were not previously cleared, mag and dig operations will be completed using a handheld magnetometer, such as a Schonstedt. In areas that were not previously mapped, DGM surveys will be conducted using EM61s over approximately 60 acres in the area surrounding the OD Hill.

At locations where the DGM survey indicates that there is impacted soil, the soil will be excavated and incorporated under the site cap. The area will then be resurveyed and the results of the DGM survey will be used to generate a dig list; these anomalies will be reacquired and intrusively investigated.

For the other areas, the anomalies on the generated dig list will be reacquired and intrusively investigated by a geophysicist and UXO dig team, and a mag and dig survey will be completed in areas near the OD Hill that are overgrown or sloped (e.g., where a DGM survey was not completed). A two-person UXO technician/demolition team will perform any required MPPEH demolition procedures. The demolition team will dispose of any MPPEH suspected of containing explosives/spotting charges or inaccessible voids by detonation. All MD will be certified and disposed of as MDAS in accordance with current regulations. The excavated soil will be placed on the OD Hill and the resulting surface will be compacted and graded. An engineered cap at least 18-inches thick will be installed over the OD Hill and the surrounding area. The exact extent of the cap will be defined during the remedial design based on geophysical data and soil results.

LTM would include monitoring of the cap. It is not anticipated that groundwater is a media of concern, but the water quality may be evaluated following completion of the construction. As such, LTM of existing and new groundwater wells would be assumed to be part of the alternative.

LUCs would be implemented at the Site to prohibit the use of groundwater, prohibit digging and prevent the use of the site as a daycare or for residential activities.

4.3.2.2 Assessment

Threshold Factors

There is a high level of overall protectiveness of human health and the environment with the implementation of this remedy. Potential MPPEH would be removed from the Site and a cap would be installed to prevent contact with any metals-contaminated soil at the OD Hill. This is a long-term solution that would be highly protective with the LTM of the cap and the LUCs. During remedial actions, the community is shielded from construction activities by security measures already in place at the site. The protection of site workers will be ensured by using trained UXO personnel and by providing other personnel with UXO Technician escorts. The implementation of this alternative would result in decreased human receptor interaction and reduced exposure to potential MPPEH. As a result of access controls which reduce exposure to MPPEH, Alternative 2 is protective of human health; however, Alternative 2 cannot completely control behavior or restrict access to residual soil contamination. Additionally, although access to potentially contaminated soils will be prevented by the cap, Alternative 2 will allow residual contamination above NYS Commercial SCOs to remain at the site therefore the Site is not suitable for residential activities. Alternative 2 prevents exposure to soil with concentrations above the SCO specified in the ARARs by preventing access to soils above the SCO through the use of a cap and LUCs.

Balancing Factors

It is possible that not all MPPEH contamination would be removed; therefore, risk would be managed not by source removal but through controls to limit an exposure pathway (i.e., interaction). Controls for exposure would include a NYS Part 360 cap, long-term management of the cap conditions, and LUC measures such as prohibition of digging or use for residential or daycare facilities. Long term management/monitoring would include annual inspections, maintenance of the cap and the LUCs, and performing five-year reviews. The LUCs would be maintained through the deed restriction/ environmental easement, and the implementation of the controls would be confirmed through annual LUC reviews and the 5-year review. Though impacted soil will remain on-site under the cap, there is no residual risk for human exposure while the LUCs are in place.

This alternative does not employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances.

There would be a potential short term impact during the demolition of any MEC items. A health and safety plan (HASP) would be prepared and all work would be conducted in accordance with the HASP and USACE UXO requirements. Mitigations strategies will be implemented during the demolition such that any potential risk to public health would be minimized.

The long-term effectiveness for the alternative is high since the intrusive investigations, surface excavations, cap, and LUC would be effective at limiting exposure pathways.

There are no implementability concerns posed by this alternative, and Alternative 2 is readily implementable from a technical perspective. Hand digging anomalies is a common and proven technique to address MPPEH.

The total capital cost for this alternative is $8.0M. The TPV (30-year present worth) cost of this alternative is estimated to be $8.9M. The capital costs include document preparation, implementation of the field work for the remedial action, design, etc. The total costs include $31,500 per year for LUC inspections and cap maintenance, plus $40,300 per five-year review over the 30 year period. If the site cannot be used for unrestricted use, five-year reviews will continue beyond the 30-year cost period.

Summary – Alternative 2

The RAOs are achieved through implementation of this alternative through decreased human exposure to MPPEH; this alternative provides significant reduction in toxicity, mobility, or volume of MPPEH. This alternative provides for good long-term effectiveness and permanence and is easily implemented. The cost associated with implementing this alternative is moderate. There are minimal long-term maintenance costs.

4.3.3 Alternative 3 – Geophysical Mapping/Intrusive Investigation/Excavation/Off-Site Disposal/LUCs

4.3.3.1 Description

This alternative is similar to Alternative 2, although it includes excavation of the soil at the OD Hill followed by off-site disposal instead of placement below a cap.

The DGM, reacquisition, mag and dig surveys, and intrusive investigations steps described in Alternative 2 are included in Alternative 3 as well. An area surrounding the OD Hill will be delineated based on the DGM survey results. Soils will be excavated to native material. Excavated soils would be processed using a screening table (or similar) to identify and remove any potential debris or MPPEH. Excavated soils will be sampled, and soils deemed free from MPPEH and meeting site cleanup standards will be staged on-site for potential re-use. The excavated area will be graded and re-vegetated to promote positive drainage and to match the natural ground contour. Soils not appropriate for reuse at the Site (e.g., soils intermixed with debris or above the cleanup standards) will be disposed of at an approved Subtitle D landfill. Identified MPPEH will be demolished appropriately, as described in Alternative 2.

It is not anticipated that groundwater is a media of concern, but the water quality may be evaluated following completion of the construction. As such, to evaluate the impacts of the remedial action on the groundwater, a post-remedial action groundwater sampling event of existing and potential new groundwater wells would be assumed to be part of the alternative.

LUCs will be placed on the site to prohibit the use of groundwater, prohibit digging, and prevent the use of the site as a day care or for residential activities.

Implementation of this alternative with excavation would be highly effective in reducing the toxicity, mobility, and volume of potential MPPEH and soil contamination. However, costs would for excavation and off-site disposal would be considered extremely high.

4.3.3.2 Assessment

Threshold Factors

There is a high level of overall protectiveness of human health and the environment with the implementation of this remedy. MPPEH and soil contamination would be removed from the Site through intrusive investigation and excavation. This is a long-term solution as both the MEC source and any soil identified outside of appropriate screening criteria would be removed. During remedial actions, the community is shielded from construction activities by security measures already in place at the site. The protection of site workers will be ensured by using trained UXO personnel and by providing other personnel with UXO Technician escorts. The environment would be protected during excavation activities by using the proper construction best management practices. The implementation of this alternative would eliminate any potential exposure to MPPEH by permanently removing the soil and the MPPEH and minimizing concern of residual MPPEH. Alternative 3 will comply with the chemical-specific ARARs identified for the site by the client subsequent to selection of an alternative remedy detailed in this FS. Chemical-specific ARARs will be addressed by achieving the Commercial SCOs for soil remaining on-site.

Balancing Factors

Alternative 3 would meet the long-term effectiveness and permanence criteria through the removal and proper disposition of MPPEH and off-site disposal of soil contamination. There would be significant reduction of toxicity, mobility, or volume at the Site through removal of MPPEH and contaminated soil. Though it is noted that no treatment will be employed.

This alternative would have moderate implementability rating given the permitting and logistics requirements for the off-site disposal of the excavated material.

There would be a potential short term impact during the demolition of any MEC items. A HASP would be prepared and all work would be conducted in accordance with the HASP and USACE UXO requirements. Mitigations strategies will be implemented such that any potential risk to public health would be minimized.

The long-term effectiveness for the alternative is high since the intrusive investigations, excavation, off-site disposal, and LUCs would be effective at limiting exposure pathways. The risk of exposure to MC or MPPEH would be removed from the site.

There is a high cost for this alternative, with a total capital cost of $27.6M. The TPV (30-year present worth) cost of this alternative is estimated to be $28.0M. The capital costs include document preparation, implementation of the field work for the remedial action, design, excavation. The total costs include $10,800 per year for LUC inspections, plus $40,300 per five-year review over the 30 year period. If the site cannot be used for unrestricted use, five-year reviews will continue beyond the 30-year cost period. If the site is approved for unlimited use/unrestricted exposure, the five-year reviews may be terminated.

The MPPEH contamination would be removed; therefore, long-term management and permanence would be achieved by source removal.

Summary – Alternative 3

The RAOs are achieved through implementation of this alternative through decreased human exposure to potential MPPEH; this alternative provides good reduction in toxicity, mobility, or volume of MPPEH. This alternative provides for good long-term effectiveness and permanence. The alternative will require some permitting to be implemented. The cost associated with implementing this alternative is very high.

4.4 COMPARATIVE ANALYSIS OF ALTERNATIVES

In the following analysis, the alternatives are evaluated in relation to one another for each of the evaluation criteria to identify the relative advantages and disadvantages of each alternative in terms of the threshold and balancing criteria. **Table 4-1** ranks the alternatives, and **Table 4-2** summarizes the costs for these alternatives. Details regarding the comparative analysis are provided in the following sections.

4.4.1 Overall Protection of Human Health and the Environment

The protectiveness criterion was evaluated in terms of possible human and ecological interaction with potential MPPEH or soil contamination. Each alternative was evaluated in terms of whether it would reduce or remove the amount of MPPEH and/or soil contamination at the OD Grounds. Alternatives 2 and 3 are ranked equally favorably. Alternatives 2 and 3 both provide good protection of both human health and the environment by limiting exposure to MPPEH or soil contamination. The limitation of Alternative 2 with regards to environmental protection is the potential for soil contamination remaining under the soil cap above screening criteria; however, the implementation of LUC would make Alternative 2 equally protective of human health. Alternative 3 has a high level of permanence since soil and MPPEH would be removed off-site and analytical sampling would confirm that remaining in-situ soils were below the selected screening criteria. With both Alternatives 2 and 3, there continues to be the possibility that all MPPEH may not have been identified and there is a residual risk that some MPPEH may remain on-site. The LUCs component of the remedies proposed in Alternatives 2 and 3 makes each alternative equally protective of limiting exposure.

Alternative 1 provides the least overall protection of human health and the environment because it does not remove or restrict access to potential MPPEH or reduce the in-situ toxicity, mobility, and volume of soil contamination.

4.4.2 Compliance with ARARs and Issues To Be Considered

Alternatives 2 and 3 are equally ranked as both comply with the chemical-specific ARAR identified for the OD Grounds and each of these alternatives provides a mechanism for either removing or controlling exposure to contaminated soil. However, Alternative 1 does not provide a mechanism for removing or controlling exposure to MPPEH contamination and does not comply with the ARAR.

4.4.3 Long-term Effectiveness and Permanence

The permanence criterion evaluates the degree to which an alternative permanently reduces or eliminates the potential for MPPEH or contaminated soil exposure hazards. Alternative 3 provides a higher degree of long-term effectiveness and permanence based on the permanence of removing metals contaminated soil from the OD Hill site. Alternative 2 was determined to provide good effectiveness by reducing possible receptor interaction with MPPEH or contaminated soil. Alternative 1 offers no long-term effectiveness and permanence.

4.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 2 and 3 offer a reduction in toxicity and mobility by completing the intrusive investigations and either capping or excavating the impacted soil. Alternative 1 offers no reduction in toxicity, mobility, or volume of contaminants and was assigned the lowest ranking. Alternative 3 offers the strongest approach to the removal of all toxicity from the site since any contamination would be removed from the site rather than managed. Alternative 3 offers volume reduction on-site by disposal of soil off-site; although the toxicity is reduced at the site this alternative does not include any treatment of the removed soil.

4.4.5 Short-term Effectiveness

No additional risk to the community, site workers, or the environment is provided by Alternative 1; however, Alternative 1 is determined to have the greatest risk and least short-term effectiveness due to no actions taken to remove the MPPEH and contaminated soil risk therefore a continued impact for existing conditions will persist.

Locally, during implementation of Alternatives 2 and 3, a temporary increase in dust may be associated with cap installation and/or excavation; however, the local community is generally buffered from these activities due to the location of the site within SEDA. Both Alternative 2 and 3 would require UXO personnel who would be exposed to explosive hazards. Alternative 2 requires less excavation than Alternative 3 however both require the installation of a soil cap; therefore, protection would be required against dermal contact and dust inhalation during construction activities.

Both Alternative 2 and 3 would provide similar short-term effectiveness in a similar amount of time (i.e., months). Alternatives 2 and 3 include demolition of recovered MPPEH thus quickly reducing the explosive hazard at the site. Alternative 3, which includes off-site transportation and disposal, has a short-term negative impact of hauling materials on public roads outside of the Depot, which can impact the surrounding community. Alternative 2 is the most favorable for short-term effectiveness as it eliminates exposure to human health and the environment by the active remediation steps and the implementation of the LUCs.

4.4.6 Implementability

Alternative 1 is the easiest to implement since it requires no action. Alternatives 2 and 3 are both technically and administratively feasible. The DGM and intrusive investigations use standard techniques common to munitions work. Both alternatives will require LTM of the LUCs. Alternative 3 has the additional burden of satisfying local, state, and federal permitting require meetings for transportation and disposal; therefore, Alternative 2 is the more feasible option.

4.4.7 Cost

The cost criterion evaluates the financial cost to implement the alternative. The cost criterion includes direct, indirect, and long-term maintenance (O&M) costs. Direct costs are those costs associated with the implementation of the alternative. Indirect costs are those costs associated with administration, oversight, and contingencies. These costs were adapted from costs associated with similar activities at the Depot. These costs presented do not include costs for SEDA to administer and provide oversight for the respective activities.

The actual costs will depend on true labor rates, actual site conditions, final project scope, and other variable factors. The alternative with the lowest cost to implement would be Alternative 1, which requires no action; therefore, no costs are incurred. Alternative 2 requires moderate costs compared to Alternative 3 which is the most costly to implement. Alternative 3 is an order of magnitude higher than the cost of Alternative 2.

Costs range from $0 (Alternative 1) to approximately $28.0M (Alternative 3). Alternative 3 has the highest cost because of the costs incurred for the excavation, transportation, and off-site disposal. **Table 4-2** summarizes costs for all alternatives, and **Appendix D** provides additional cost information.

4.4.8 State Acceptance

State acceptance cannot be fully evaluated and assessed until comments on the FS and the proposed plan are received. Modifying criteria (i.e., state and community acceptance), however, are considered in remedy selection. It is anticipated that Alternative 1 would not be acceptable to the state due to its lack of long-term effectiveness.

4.4.9 Community Acceptance

Community acceptance cannot be fully evaluated and assessed until comments on the proposed plan are received.

4.4.10 MEC Hazard Assessment Results

Based on the MEC HA conducted for each assessment area (provided in **Appendix C**), with regards to the reduction of potential MEC hazards, Alternative 2 and Alternative 3 provide identical levels of reduction of MEC hazards compared to the baseline condition. The MEC HA is summarized in Section 1.5 and presented in full in **Appendix C**. Implementation of Alternative 2 or 3 would decrease the hazard level rating to a “4”, “low potential explosive hazard conditions”. Note that these total MEC HA scores and the associated hazard levels are *qualitative references only* and should <u>not</u> be interpreted as quantitative measures of explosive hazard.

4.4.11 Summary of Comparative Analysis

The three alternatives were evaluated in terms of seven criteria. **Table 4-1** summarizes the alternatives and identifies the most practicable solution for reducing the potential MPPEH exposure hazard at the OD Grounds. In some cases, more than one alternative was identified within the same evaluation category, indicating that those alternatives have similar compliance with the criterion.

Alternative 1 must be ruled out because it is ineffective in long-term permanence and does not achieve the RAOs. Overall, Alternatives 2 and 3 have similar levels of protectiveness, permanence, long-term effectiveness, and short-term effectiveness. They will both limit exposure to potential MPPEH or contaminated soil. Alternative 3 ranks slightly higher for the reduction of toxicity, mobility, or volume due to the volume reduction of off-site disposal. Alternative 2 rates more favorably for implementability. Alternative 2 ranks better in terms of cost.

Based on a comparison of the criteria, the highest ranked remedy for the OD Grounds is Alternative 2, DGM Mapping, intrusive investigation, cap, and LUCs. Alternative 2 limits human exposure to potential MPPEH or soil contamination, is implementable using known techniques, and is cost effective. The capital cost for the alternative is $8.0M. The TPV is $8.9M. The total costs include $31,500 per year for LUC inspections and cap maintenance, plus $40,300 per five-year review over the 30 year period.

Table 4-1
Ranking of Alternatives

Alternative No.	Description	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction through Treatment	Short-Term Effectiveness	Implementability	Cost	Total Score	Overall Ranking
1	**No Further Action**	1	1	1	1	3	3	3	13	# 3
2	**Geophysical Mapping/Intrusive Investigation / Capping/LUCs**	3	3	2	2	2	2	2	16	# 1
3	**Geophysical Mapping/Intrusive Investigation / Excavation/Off-Site Disposal/LUCs**	3	3	3	3	1	1	1	15	# 2

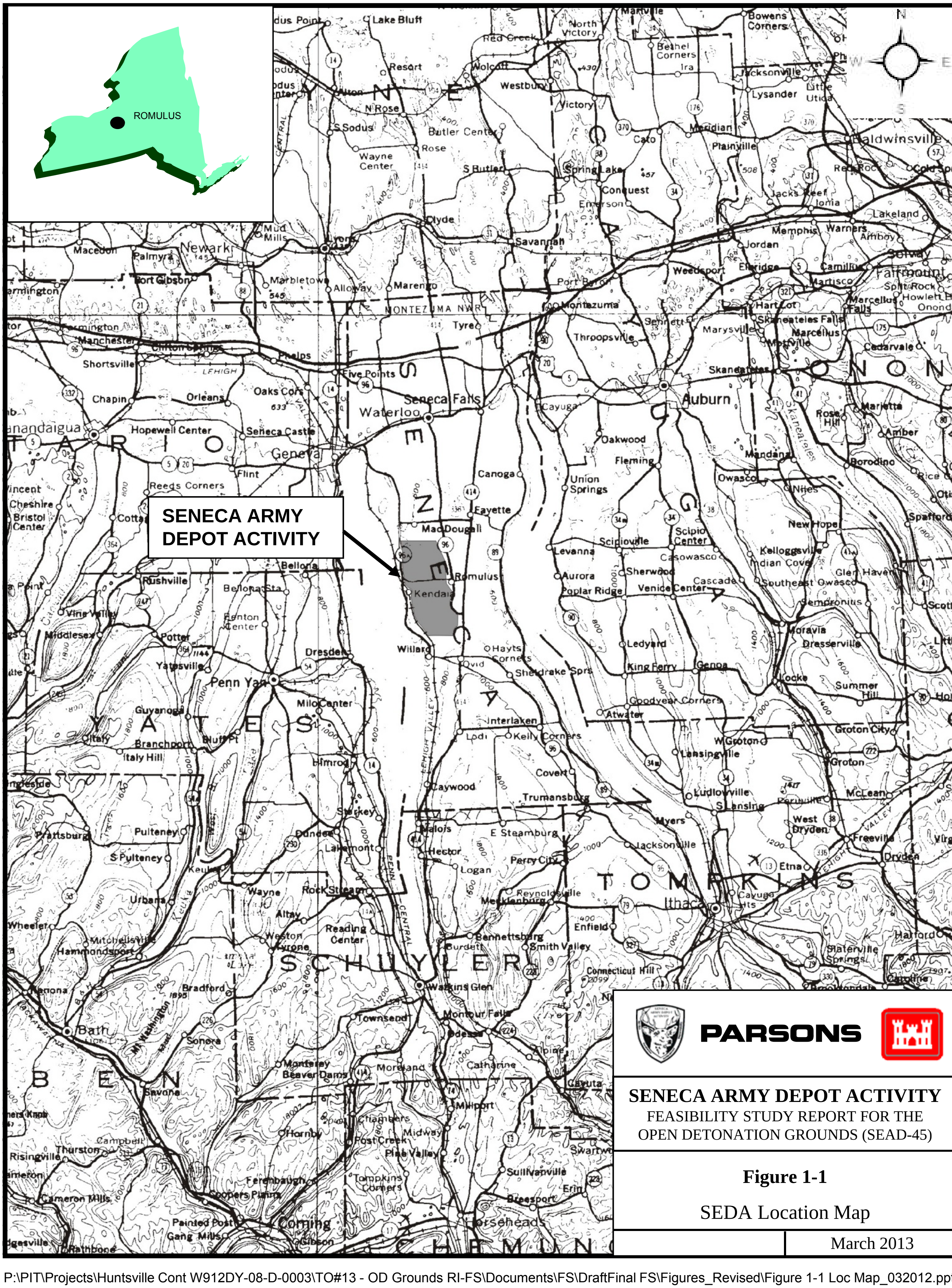
Notes:
1) Alternatives were scored 1 to 3 for each screening criterion. A score of 1 represents the least favorable score and a score of 3 represents the most favorable score.
2) The alternative with the highest total score represents the most favorable alternative. Within each screening criterion, alternatives were scored from one to three for each subcategory.
3) The total score of all subcategories is the basis for the scoring for the screening criterion.

Table 4-2
Remedial Alternatives Cost Summary

Alternative	Description	Capital Cost	Annual LTM Cost	Five-Year Review Cost (per event)	TPV at 2% Discount Rate
1	**No Further Action**	$0	--	--	--
2	**Geophysical Mapping/Intrusive Investigation/Capping/LUCs**	$7,977,000	$31,500	$40,300	$8,856,000
3	**Geophysical Mapping/Intrusive Investigation/Excavation/Off-Site Disposal/LUCs**	$27,552,000	$10,800	$40,300	$27,967,000

Notes:
1) Discount rate of 2% per OMB (2014) and USEPA (2000) guidance was used to estimate TPV.
2) TPV includes six five- year review events and the annual long-term monitoring.

FIGURES



SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY REPORT FOR THE
OPEN DETONATION GROUNDS (SEAD-45)

Figure 1-1

SEDA Location Map

March 2013

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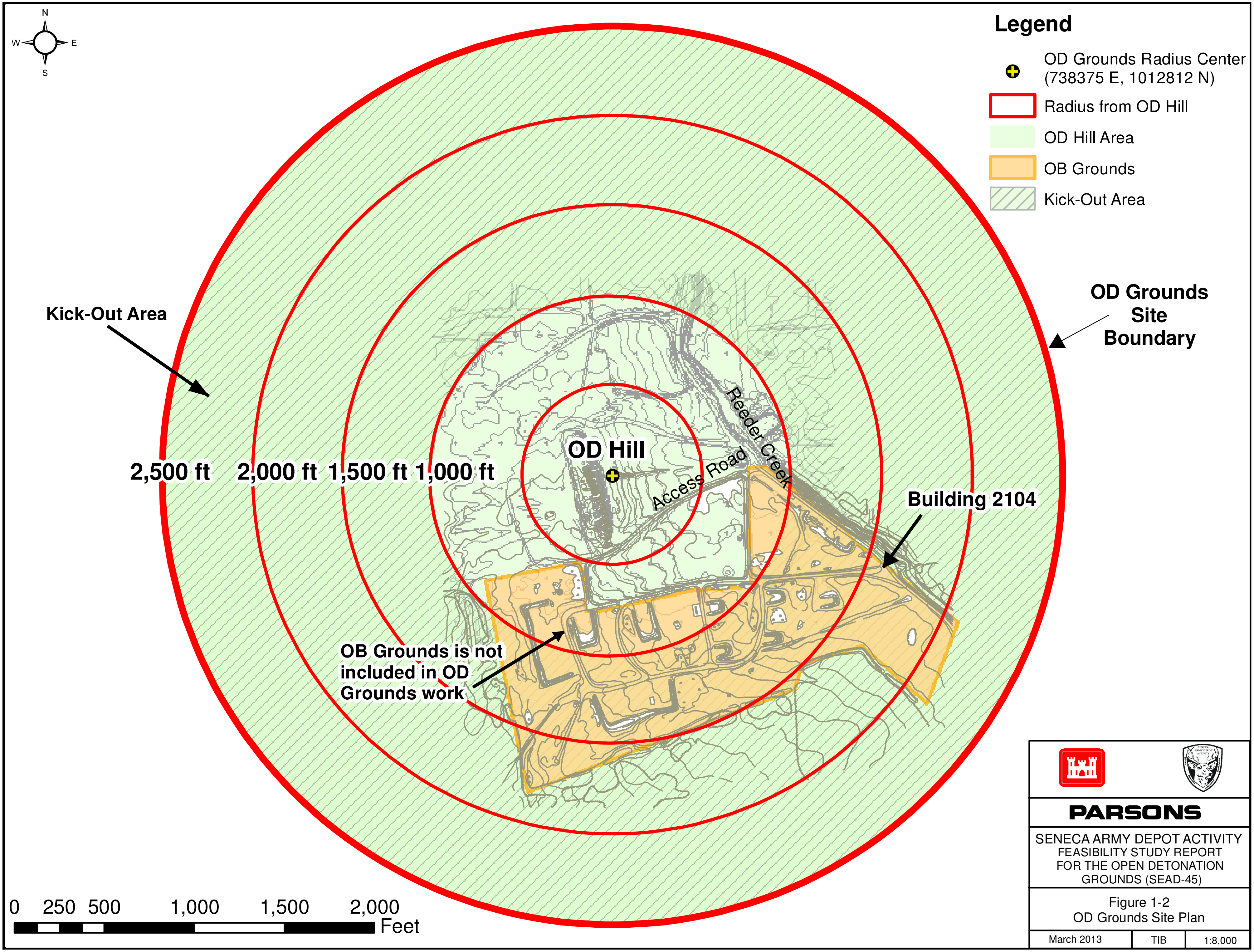

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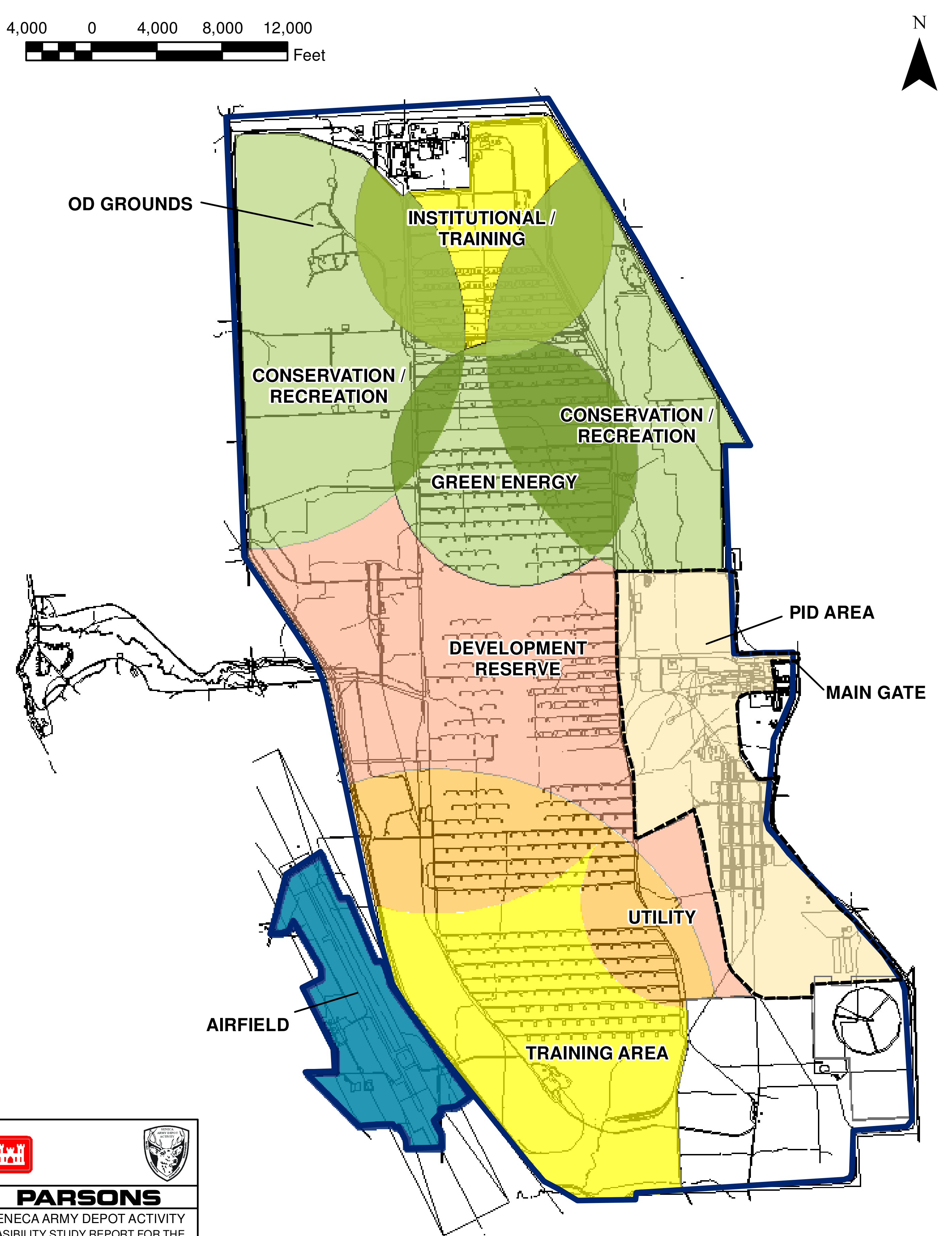

PARSONS

SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY REPORT FOR THE OPEN DETONATION GROUNDS (SEAD-45)

Figure 1-3
SEDA Future Land Use

March 2013 | BBO

Legend
- Site Boundaries
- Explosive Storage Magazines
- Planned Industrial & Office Development Area (PID Area)

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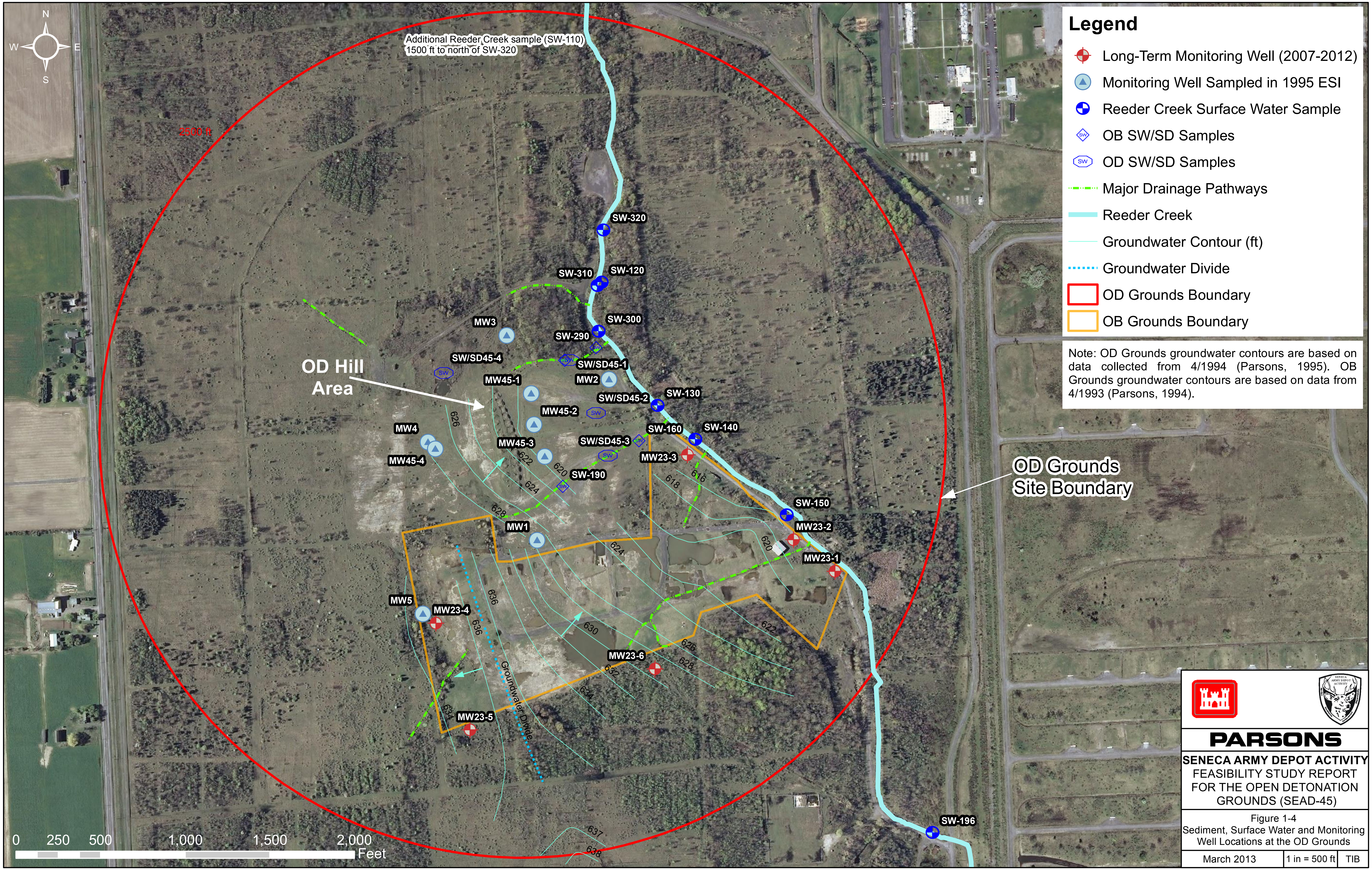

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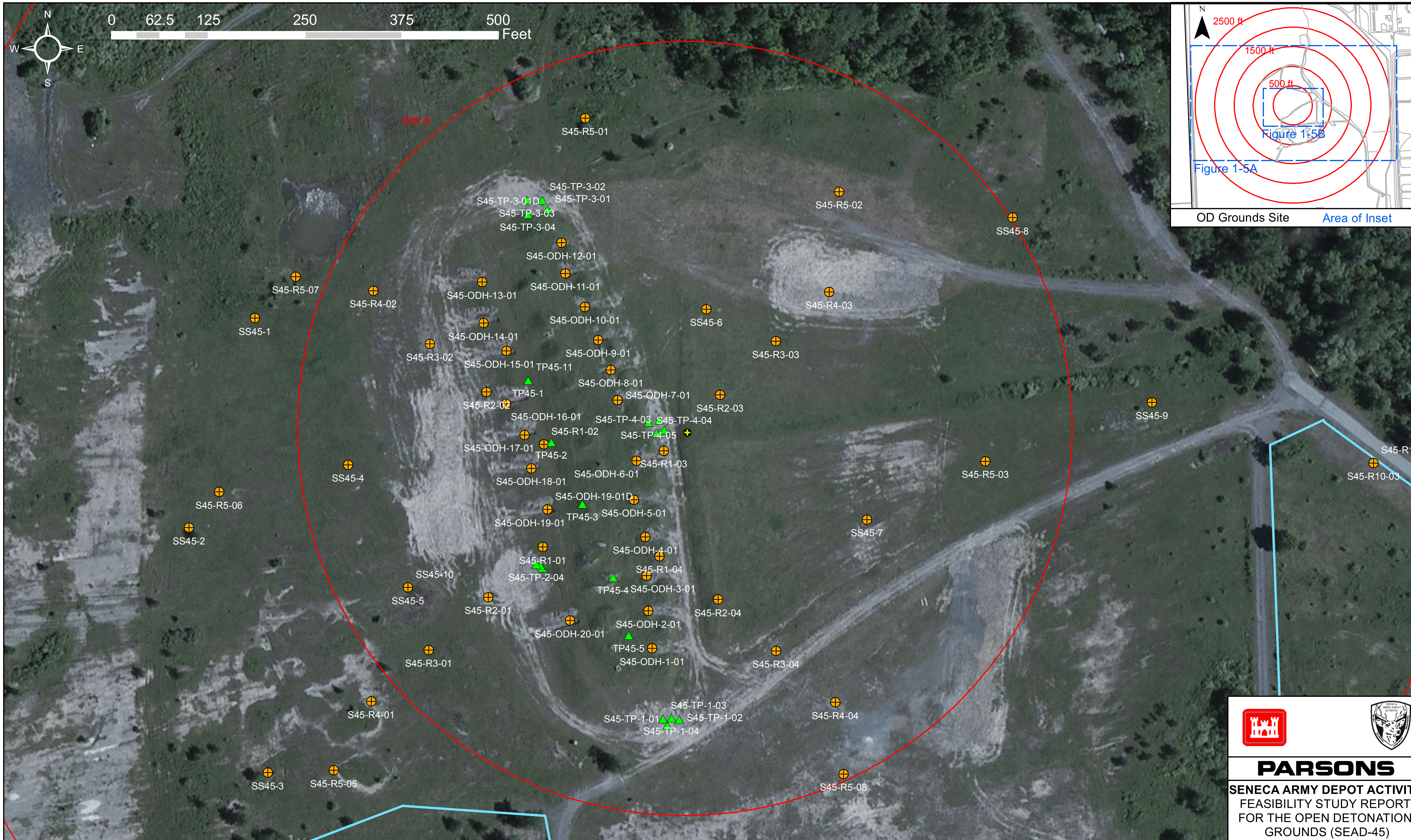
N
W
E
S
0 125 250 500 750 1,000
Feet
1500 ft
1000 ft
500 ft
S45-R15-01
S45-R15-02
S45-R15-06
S45-R10-01
S45-R10-02
S45-R10-06
See Figure 1-5B for sample locations around OD Hill
OD Hill Area
SS45-8
S45-R5-07
SS45-1
SS45-9
S45-R10-03
S45-R15-05
S45-R10-05
S45-R5-06
SS45-2
S45-R15-03
S45-R4-01
S45-R5-05
S45-R5-08
S45-R5-04
S45-R10-07
S45-R10-04
S45-R15-04
2500 ft
1500 ft
500 ft
Figure 1-5B
Figure 1-5A
OD Grounds Site
Area of Inset
Legend
500 ft
Radius Rings from OD Hill Distance from Center
Center Point of all Radius Rings (N 1012812, E 738375)
OB Grounds Boundary
Subsurface Soil Sample Location
Surface Soil Sample Location
PARSONS
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY REPORT FOR THE OPEN DETONATION GROUNDS (SEAD-45)
Figure 1-5A
Historic Soil Sample Locations at OD Grounds
March 2013
BBO



Legend

500 ft — Radius Rings from OD Hill Distance from the Center

Center Point of all Radius Rings (N 1012812, E 738375)

OB Grounds Boundary

Surface Soil Sample Location

Subsurface Soil Sample Location

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SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY REPORT FOR THE OPEN DETONATION GROUNDS (SEAD-45)

Figure 1-5B
Historic Soil Sample Locations at OD Grounds (OD Hill Area)

March 2013		BBO

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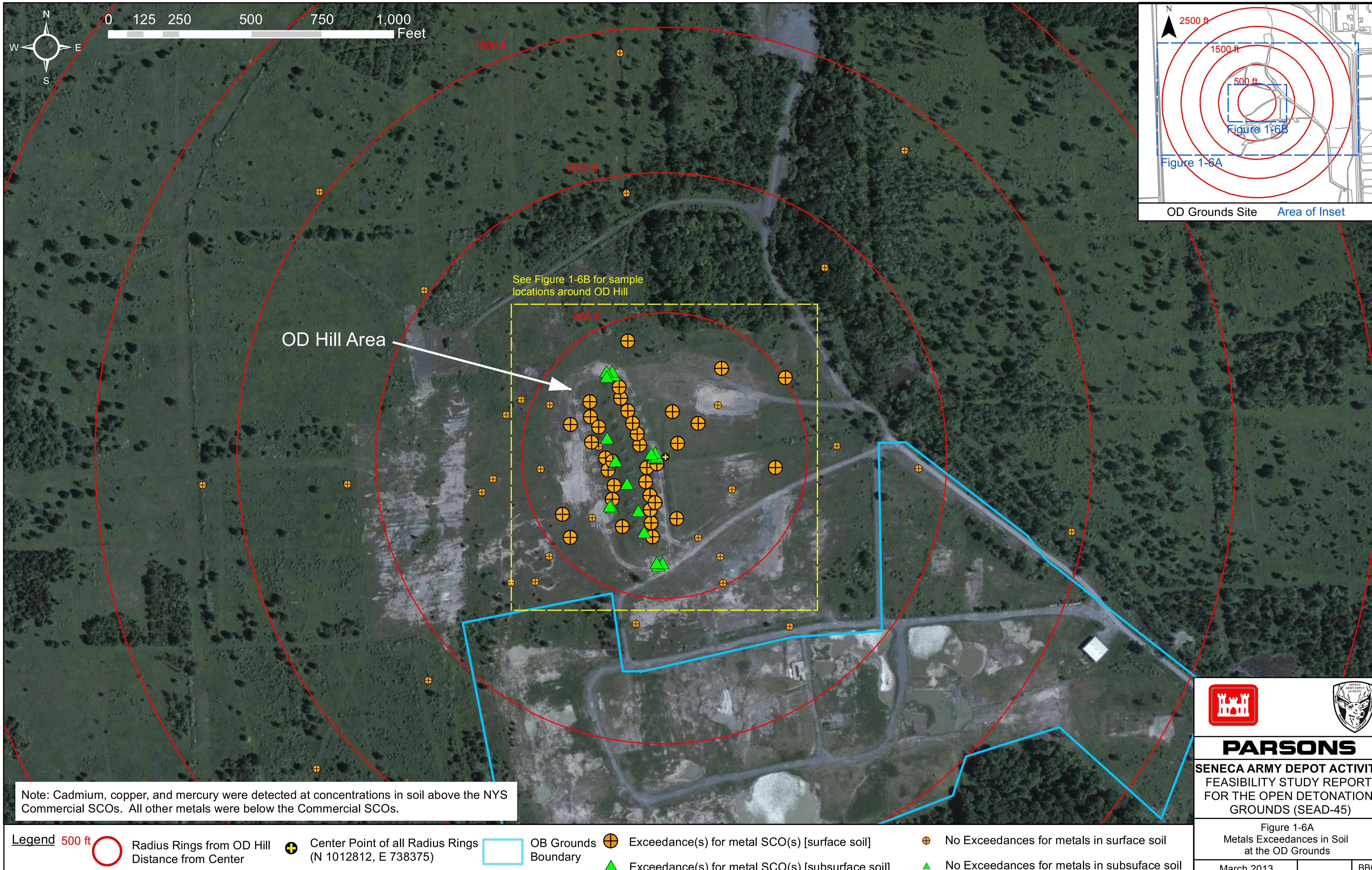

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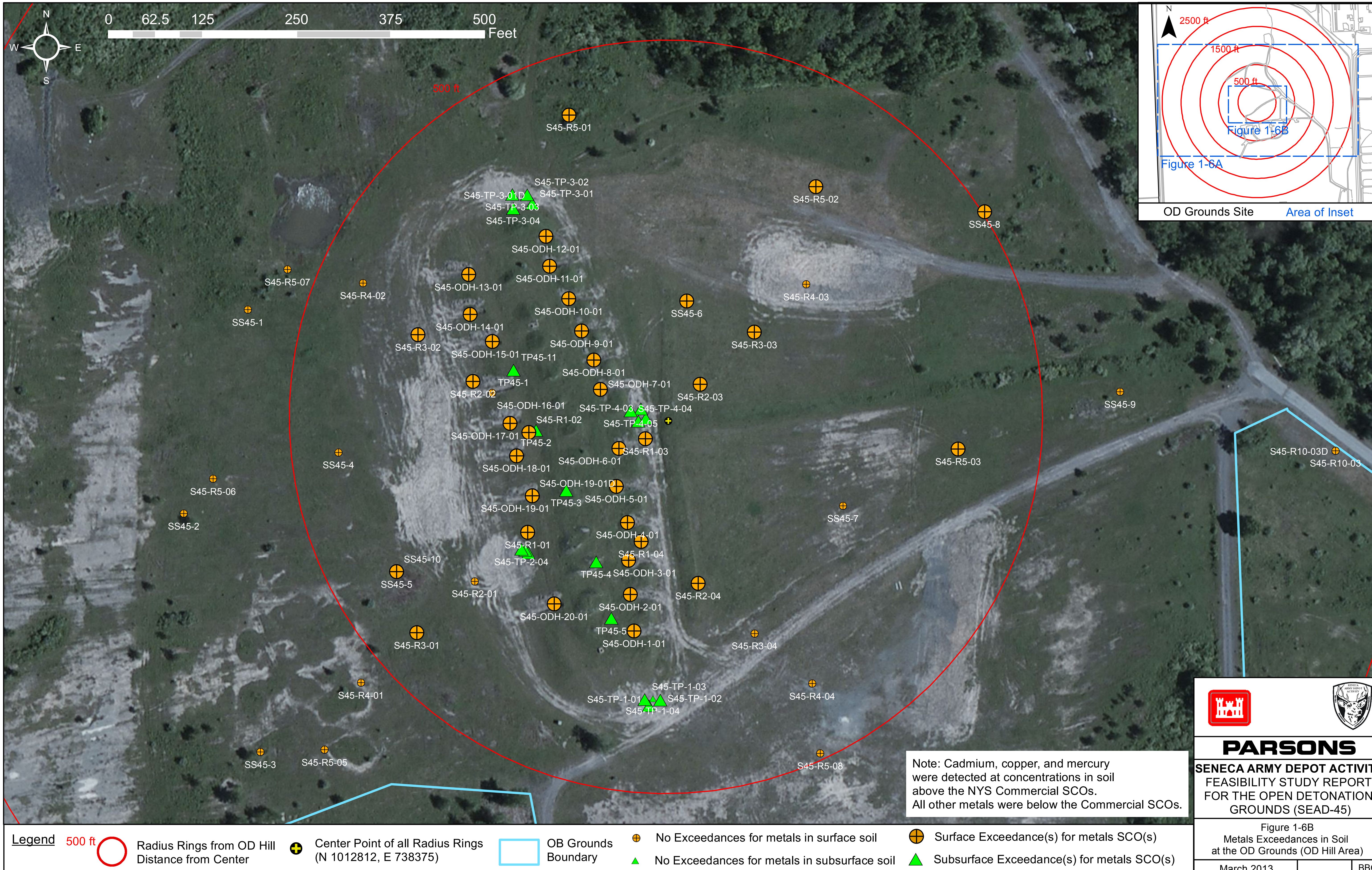

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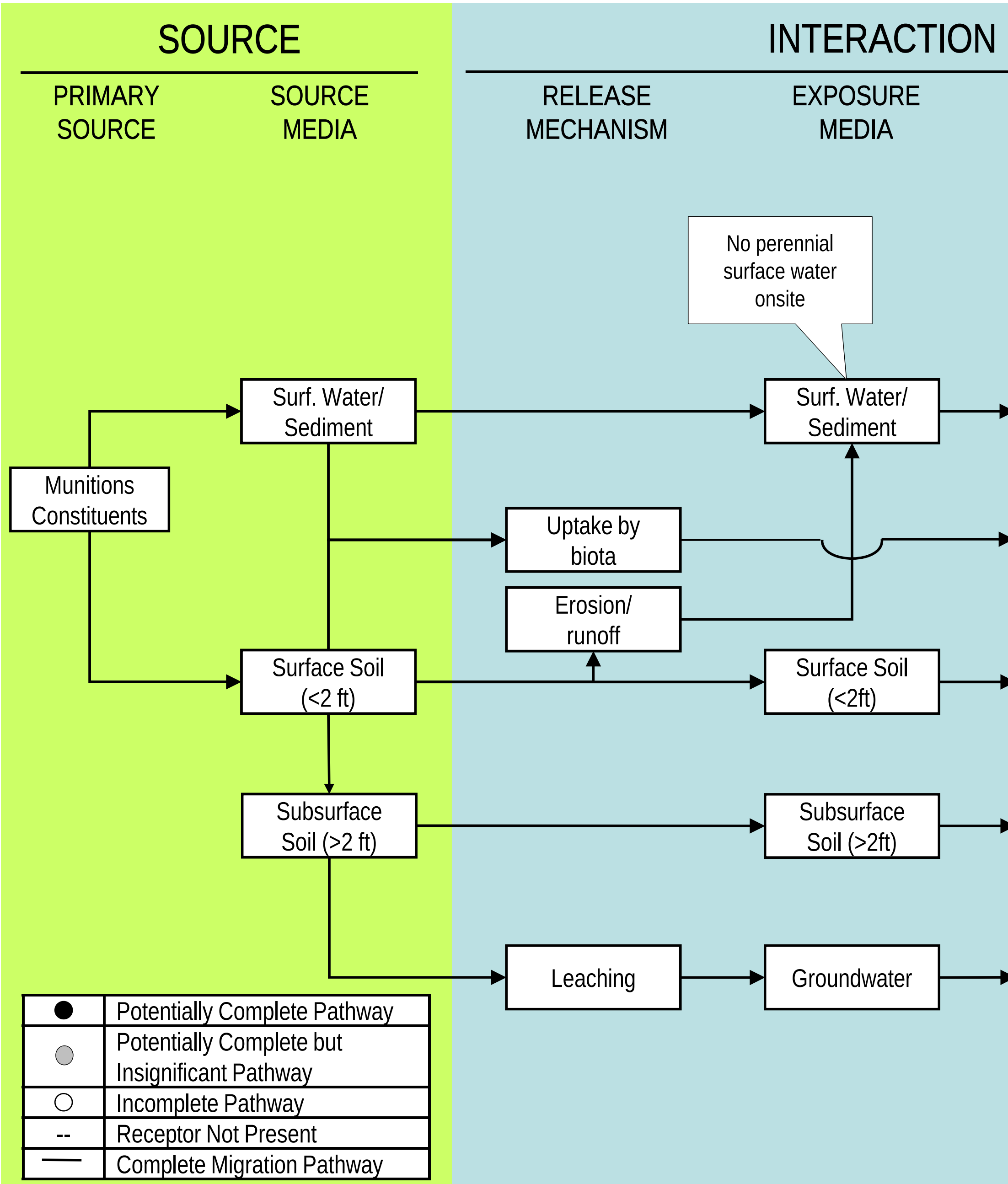
Figure 1-7A Human Health Conceptual Site Model Diagram

Site/MRS Name: Open Detonation (OD) Hill Area, OD Grounds, Seneca Army Depot Activity (SEDA), Seneca County, New York

Last Revised By: Jill Noel, PARSONS

Last Revision Date: September 12, 2014

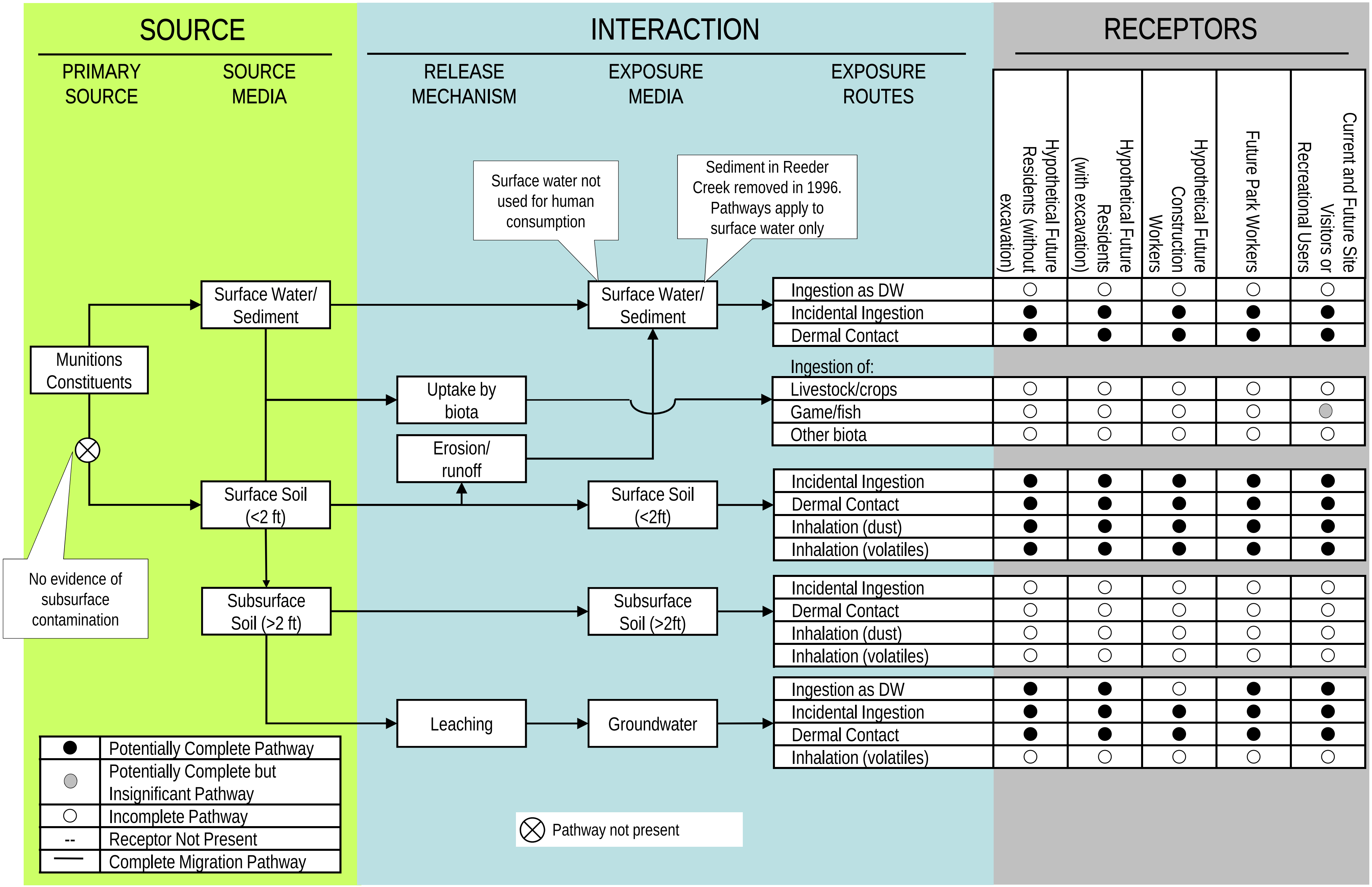


Exposure Media	Exposure Routes	Hypothetical Future Residents (without excavation)	Hypothetical Future Residents (with excavation)	Hypothetical Future Construction Workers	Future Park Workers	Current and Future Site Visitors or Recreational Users
Surf. Water/ Sediment	Ingestion as DW	○	○	○	○	○
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
Uptake by biota	Ingestion of: Livestock/crops	○	○	○	○	○
	Game/fish	○	○	○	○	◐
	Other biota	○	○	○	○	○
Surface Soil (<2ft)	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (dust)	●	●	●	●	●
	Inhalation (volatiles)	●	●	●	●	●
Subsurface Soil (>2ft)	Incidental Ingestion	○	●	●	○	○
	Dermal Contact	○	●	●	○	○
	Inhalation (dust)	○	●	●	○	○
	Inhalation (volatiles)	○	●	●	○	○
Groundwater	Ingestion as DW	●	●	○	●	●
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (volatiles)	○	○	○	○	○

Figure 1-7B Human Health Conceptual Site Model Diagram

Site/MRS Name: Kickout Area, (OD) Grounds, Seneca Army Depot Activity (SEDA), Seneca County, New York

Last Revised By: Jill Noel, PARSONS ***Last Revision Date:*** September 12, 2014



Exposure Media	Exposure Routes	Hypothetical Future Residents (without excavation)	Hypothetical Future Residents (with excavation)	Hypothetical Future Construction Workers	Future Park Workers	Current and Future Site Visitors or Recreational Users
Surface Water/ Sediment	Ingestion as DW	○	○	○	○	○
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
Ingestion of:	Livestock/crops	○	○	○	○	○
	Game/fish	○	○	○	○	◍
	Other biota	○	○	○	○	○
Surface Soil (<2ft)	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (dust)	●	●	●	●	●
	Inhalation (volatiles)	●	●	●	●	●
Subsurface Soil (>2ft)	Incidental Ingestion	○	○	○	○	○
	Dermal Contact	○	○	○	○	○
	Inhalation (dust)	○	○	○	○	○
	Inhalation (volatiles)	○	○	○	○	○
Groundwater	Ingestion as DW	●	●	○	●	●
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (volatiles)	○	○	○	○	○

●	Potentially Complete Pathway
◍	Potentially Complete but Insignificant Pathway
○	Incomplete Pathway
--	Receptor Not Present
——	Complete Migration Pathway

APPENDICES

APPENDIX A

OD GROUNDS ANALYTICAL DATA

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Sample ID							S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35		93 U	78 U			91 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35		100 U	85 U			99 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35		90 U	76 U			88 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35		99 U	83 U			97 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35		180 U	150 U			170 U
2,4,6-Trichlorophenol	UG/KG	0			0	35		180 U	150 U			170 U
2,4-Dichlorophenol	UG/KG	0			0	35		170 U	140 U			170 U
2,4-Dimethylphenol	UG/KG	0			0	35		190 U	160 U			190 U
2,4-Dinitrophenol	UG/KG	0			0	35		430 U	360 U			420 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35		98 U	82 U			96 U
2,6-Dinitrotoluene	UG/KG	700			2	35		91 U	76 U			89 U
2-Chloronaphthalene	UG/KG	0			0	35		100 U	84 U			98 U
2-Chlorophenol	UG/KG	0			0	35		190 U	160 U			180 U
2-Methylnaphthalene	UG/KG	0			0	35		100 U	89 U			100 U
2-Methylphenol	UG/KG	0	500,000	0	0	35		230 U	190 U			220 U
2-Nitroaniline	UG/KG	0			0	35		86 U	73 U			84 U
2-Nitrophenol	UG/KG	0			0	35		190 U	160 U			190 U
3 or 4-Methylphenol	UG/KG	0			0	19		210 U	180 U			210 U
3,3'-Dichlorobenzidine	UG/KG	0			0	35		130 U	110 U			130 U
3-Nitroaniline	UG/KG	0			0	35		110 U	91 U			100 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35		390 U	330 U			380 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35		98 U	82 U			96 U
4-Chloro-3-methylphenol	UG/KG	0			0	35		190 U	160 U			190 U
4-Chloroaniline	UG/KG	0			0	35		140 U	120 U			130 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35		90 U	76 U			88 U
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35		150 U	130 U			150 U
4-Nitrophenol	UG/KG	0			0	35		360 U	300 U			350 U
Acenaphthene	UG/KG	0	500,000	0	0	35		75 U	63 U			73 U
Acenaphthylene	UG/KG	30	500,000	0	3	35		80 U	68 U			79 U
Anthracene	UG/KG	18	500,000	0	2	35		96 U	81 U			95 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35		99 U	83 U			97 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35		110 U	90 U			100 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35		150 U	130 U			150 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35		120 UJ	100 UJ			120 UJ
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35		95 U	80 U			94 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Sample ID							S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35		110 U	93 U			110 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35		93 U	78 U			91 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19		100 U	86 U			100 U
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35		110 U	95 U			110 U
Butylbenzylphthalate	UG/KG	0			0	35		110 U	90 U			100 U
Carbazole	UG/KG	0			0	35		130 U	110 U			120 U
Chrysene	UG/KG	130	56,000	0	12	35		110 U	92 U			110 U
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35		150 U	120 U			140 U
Dibenzofuran	UG/KG	0	350,000	0	0	35		91 U	76 U			89 U
Diethyl phthalate	UG/KG	35			1	35		92 U	78 U			90 U
Dimethylphthalate	UG/KG	0			0	35		90 U	76 U			88 U
Di-n-butylphthalate	UG/KG	6,800			12	35		120 U	98 U			110 U
Di-n-octylphthalate	UG/KG	0			0	35		240 U	200 U			240 U
Fluoranthene	UG/KG	68	500,000	0	11	35		120 U	100 U			120 U
Fluorene	UG/KG	0	500,000	0	0	35		93 U	78 U			91 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35		94 U	79 U			92 U
Hexachlorobutadiene	UG/KG	0			0	35		95 U	80 U			94 U
Hexachlorocyclopentadiene	UG/KG	0			0	35		94 U	79 U			92 U
Hexachloroethane	UG/KG	1,100			6	35		110 U	93 U			110 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35		140 U	120 U			140 U
Isophorone	UG/KG	0			0	35		86 U	73 U			84 U
Naphthalene	UG/KG	30	500,000	0	5	35		100 U	84 U			98 U
Nitrobenzene	UG/KG	0			0	35		100 U	88 U			100 U
N-Nitrosodiphenylamine	UG/KG	320			2	35		310 J	210 U			250 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35		95 U	80 U			94 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35		270 UJ	230 UJ			270 UJ
Phenanthrene	UG/KG	46	500,000	0	9	35		95 U	80 U			94 U
Phenol	UG/KG	0	500,000	0	0	35		180 U	150 U			180 U
Pyrene	UG/KG	110	500,000	0	12	35		120 U	98 U			110 U
Herbicides												
2,4,5-T	UG/KG	0			0	35		18 U	18 U			19 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35		14 U	14 U			15 U
2,4-D	UG/KG	0			0	35		36 U	37 U			38 U
2,4-DB	UG/KG	0			0	35		26 U	27 U			28 U
Dalapon	UG/KG	0			0	35		9.2 U	9.6 U			9.7 U
Dicamba	UG/KG	0			0	35		12 U	13 U			13 U
Dichloroprop	UG/KG	0			0	35		21 U	22 U			22 U
Dinoseb	UG/KG	0			0	35		2.9 U	3 U			3 U
MCPA	UG/KG	9,400			2	35		2,600 U	2,700 U			2,700 U
MCPP	UG/KG	0			0	35		2,500 U	2,600 U			2,600 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47	55 J	51 JN	120 U	70 J	51 J	120 U
1,3-Dinitrobenzene	UG/KG	0			0	47	7.7 U	6.7 U	7.3 U	7 U	7.2 U	7.8 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	58 JN	45 JN	46 J	48 JN	40 J	55 JN
2,4-Dinitrotoluene	UG/KG	1,100			36	47	110 J	150	88 J	100 J	110 J	92 J
2,6-Dinitrotoluene	UG/KG	0			0	47	34 U	29 U	32 U	30 U	31 U	34 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	130 J	130 J	170 JN	190 J	120	200 JN
2-Nitrotoluene	UG/KG	0			0	31	15 U	13 U	14 U	13 U	14 U	15 U
3,5-Dinitroaniline	UG/KG	0			0	31	4.4 U	3.8 U	4.4 U	4 U	4.1 U	4.4 U
3-Nitrotoluene	UG/KG	0			0	31	9.8 UJ	8.5 UJ	9.4 UJ	8.9 UJ	9.2 UJ	9.9 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	120 J	120	150 JN	150 J	120	190 J
4-Nitrotoluene	UG/KG	0			0	31	34 U	29 U	32 U	30 U	31 U	34 U
HMX	UG/KG	470			32	47	87 JN	72 JN	160 JN	100 J	79 J	190 JN
Nitrobenzene	UG/KG	0			0	31	27 U	24 U	26 U	25 U	26 U	28 U
Nitroglycerine	UG/KG	1,500			1	31	150 U	130 U	150 U	140 U	140 U	160 U
Pentaerythritol Tetranitrate	UG/KG	0			0	31	300 U	260 U	280 U	270 U	280 U	300 U
RDX	UG/KG	5,800			39	47	190 JN	170	440 JN	290 J	130 JN	350 JN
Tetryl	UG/KG	330			4	47	6.7 U	5.8 U	6.4 U	6.1 U	6.3 U	6.8 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Sample ID							S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34		7 U	6.9 U			7 U
Aroclor-1221	UG/KG	0	1,000	0	0	34		16 U	16 U			16 U
Aroclor-1232	UG/KG	0	1,000	0	0	34		11 U	11 U			11 U
Aroclor-1242	UG/KG	0	1,000	0	0	34		6.8 U	6.7 U			6.8 U
Aroclor-1248	UG/KG	0	1,000	0	0	34		7.1 U	7 U			7.1 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34		5.5 U	5.4 U			5.5 U
Aroclor-1260	UG/KG	0	1,000	0	0	34		7 U	6.9 U			7 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34		0.23 U	0.23 U			0.23 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35		0.82 J	1.3 J			1.2 J
4,4'-DDT	UG/KG	3.4	47,000	0	17	34		0.87 J	1.3 JN			1.2 J
Aldrin	UG/KG	0	680	0	0	34		0.33 U	0.32 U			0.33 U
Alpha-BHC	UG/KG	0	3,400	0	0	34		0.4 U	0.39 U			0.4 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34		0.24 U	0.24 U			0.24 U
Beta-BHC	UG/KG	0	3,000	0	0	34		0.38 U	0.38 U			0.38 U
Delta-BHC	UG/KG	0	500,000	0	0	34		0.37 U	0.37 U			0.37 U
Dieldrin	UG/KG	3.2	1,400	0	14	34		0.77 J	1 J			0.96 J
Endosulfan I	UG/KG	55	200,000	0	21	35		0.79 J	32 JN			1 J
Endosulfan II	UG/KG	0.88	200,000	0	1	34		0.4 UJ	0.39 UJ			0.4 UJ
Endosulfan sulfate	UG/KG	0	200,000	0	0	34		0.68 U	0.67 U			0.68 U
Endrin	UG/KG	3.6	89,000	0	1	34		0.99 U	0.98 U			0.99 U
Endrin aldehyde	UG/KG	0			0	34		0.57 U	0.56 U			0.57 U
Endrin ketone	UG/KG	0.58			1	34		0.46 U	0.58 J			0.47 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34		0.31 U	0.31 U			0.31 U
Gamma-Chlordane	UG/KG	1.1			3	34		0.27 U	0.26 U			0.27 U
Heptachlor	UG/KG	0	15,000	0	0	34		0.34 U	0.33 U			0.34 U
Heptachlor epoxide	UG/KG	0			0	34		0.26 U	0.25 U			0.26 U
Methoxychlor	UG/KG	45			1	34		0.58 U	0.57 U			0.58 U
Toxaphene	UG/KG	0			0	34		8.2 U	8 U			8.2 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	18,000	19,100	17,900	16,500	19,000	23,600
Antimony	MG/KG	5.1			32	97	0.13 UJ	0.16 J	0.2 UJ	0.2 UJ	0.89 UJ	0.19 UJ
Arsenic	MG/KG	12.6	16	0	97	97	5 J	5.1 J	8.6 J	6.2 J	4.7 J	4.6 J
Barium	MG/KG	365	400	0	97	97	195	186	193	189	171	182
Beryllium	MG/KG	1.2	590	0	95	97	0.8	0.85	0.79	0.73	0.85	0.8
Cadmium	MG/KG	1,100	9.3	11	77	95	8.1	7	**23.6**	6.3	7.8	7.4
Calcium	MG/KG	193,000			96	97	24,400	27,800	23,200	19,400	31,400	26,700
Chromium	MG/KG	446	1,500	0	97	97	28.1	28.5	446	30.1	27.8	30.5
Cobalt	MG/KG	26.8			97	97	13.5	11.2	13.1	10.8	11.2	12.6
Copper	MG/KG	7,310	270	52	97	97	**448**	**436**	**1,060**	**314**	**515**	**633**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	25,800	27,200	53,100	27,700	26,300	26,500
Lead	MG/KG	998	1,000	0	97	97	62.6	55.6	64	43.1	51.7	56.7
Magnesium	MG/KG	15,000			97	97	6,780	7,140	7,040	5,860	7,710	7,000
Manganese	MG/KG	5,040	10,000	0	97	97	742	581	799	655	590	624
Nickel	MG/KG	59.3	310	0	92	92	39.5	37.3	59.3	37.8	36.6	39.6
Potassium	MG/KG	4,880			76	76	2,760 R	3,400 R	2,880 R	2,400 R	3,320 R	2,980 R
Selenium	MG/KG	0.92	1,500	0	4	97	0.29 U	0.25 U	0.44 U	0.43 U	0.24 U	0.43 U
Silver	MG/KG	205	1,500	0	66	97	3.6	3.8	5	3 U	3.6	3.5
Sodium	MG/KG	213			81	97	106 J	131 J	112 J	103 J	128 J	135 J
Thallium	MG/KG	0.27			6	97	0.12 U	0.23 J	0.19 U	0.18 U	0.1 J	0.18 U
Vanadium	MG/KG	41.9			97	97	29.2	31.4	30.6	25.9	31.7	29.8
Zinc	MG/KG	1,470	10,000	0	92	92	359	327	421	225	314	312
Mercury	MG/KG	9.1	2.8	49	96	97	**3.8**	**4**	**4.5**	**3.7**	1.6	**4.4**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

						Area	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
						Loc ID	S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01
						Sample ID	S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01D
						Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
						Sample Depth Interval (FT)	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
						Sample Date	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
						QC Type	SA	SA	SA	SA	SA	DU
						Study ID	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35			89 U		94 U	87 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35			97 U		100 U	94 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35			86 U		91 U	84 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35			94 U		100 U	92 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35			170 U		180 U	170 U
2,4,6-Trichlorophenol	UG/KG	0			0	35			170 U		180 U	170 U
2,4-Dichlorophenol	UG/KG	0			0	35			160 U		180 U	160 U
2,4-Dimethylphenol	UG/KG	0			0	35			180 U		190 U	180 U
2,4-Dinitrophenol	UG/KG	0			0	35			410 U		440 U	400 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35			260 J		280 J	91 U
2,6-Dinitrotoluene	UG/KG	700			2	35			87 U		92 U	85 U
2-Chloronaphthalene	UG/KG	0			0	35			96 U		100 U	93 U
2-Chlorophenol	UG/KG	0			0	35			180 U		190 U	180 U
2-Methylnaphthalene	UG/KG	0			0	35			100 U		110 U	99 U
2-Methylphenol	UG/KG	0	500,000	0	0	35			220 U		230 U	210 U
2-Nitroaniline	UG/KG	0			0	35			82 U		88 U	80 U
2-Nitrophenol	UG/KG	0			0	35			180 U		190 U	180 U
3 or 4-Methylphenol	UG/KG	0			0	19			200 U		220 U	200 U
3,3'-Dichlorobenzidine	UG/KG	0			0	35			120 U		130 U	120 U
3-Nitroaniline	UG/KG	0			0	35			100 U		110 U	100 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35			370 U		390 U	360 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35			93 U		99 U	91 U
4-Chloro-3-methylphenol	UG/KG	0			0	35			180 U		190 U	180 U
4-Chloroaniline	UG/KG	0			0	35			130 U		140 U	130 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35			86 U		91 U	84 U
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35			150 U		160 U	140 U
4-Nitrophenol	UG/KG	0			0	35			340 U		360 U	330 U
Acenaphthene	UG/KG	0	500,000	0	0	35			71 U		76 U	70 U
Acenaphthylene	UG/KG	30	500,000	0	3	35			77 U		82 U	75 U
Anthracene	UG/KG	18	500,000	0	2	35			92 U		98 U	90 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35			94 U		100 U	92 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35			100 U		110 U	100 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35			150 U		160 U	140 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35			110 UJ		120 UJ	110 UJ
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35			91 U		97 U	89 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01
Sample ID							S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01D
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	DU
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35			100 U		110 U	100 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35			89 U		94 U	87 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19			98 U		100 U	96 U
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35			110 U		110 U	100 U
Butylbenzylphthalate	UG/KG	0			0	35			100 U		110 U	100 U
Carbazole	UG/KG	0			0	35			120 U		130 U	120 U
Chrysene	UG/KG	130	56,000	0	12	35			100 U		110 U	100 U
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35			140 U		150 U	140 U
Dibenzofuran	UG/KG	0	350,000	0	0	35			87 U		92 U	85 U
Diethyl phthalate	UG/KG	35			1	35			88 U		93 U	86 U
Dimethylphthalate	UG/KG	0			0	35			86 U		91 U	84 U
Di-n-butylphthalate	UG/KG	6,800			12	35			330 J		120 U	110 U
Di-n-octylphthalate	UG/KG	0			0	35			230 U		250 U	230 U
Fluoranthene	UG/KG	68	500,000	0	11	35			120 U		120 U	110 U
Fluorene	UG/KG	0	500,000	0	0	35			89 U		94 U	87 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35			90 U		96 U	88 U
Hexachlorobutadiene	UG/KG	0			0	35			91 U		97 U	89 U
Hexachlorocyclopentadiene	UG/KG	0			0	35			90 U		96 U	88 U
Hexachloroethane	UG/KG	1,100			6	35			100 U		110 U	100 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35			130 U		140 U	130 U
Isophorone	UG/KG	0			0	35			82 U		88 U	80 U
Naphthalene	UG/KG	30	500,000	0	5	35			96 U		100 U	93 U
Nitrobenzene	UG/KG	0			0	35			100 U		110 U	98 U
N-Nitrosodiphenylamine	UG/KG	320			2	35			240 U		260 U	240 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35			91 U		97 U	89 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35			260 UJ		280 UJ	250 UJ
Phenanthrene	UG/KG	46	500,000	0	9	35			91 U		97 U	89 U
Phenol	UG/KG	0	500,000	0	0	35			170 U		180 U	170 U
Pyrene	UG/KG	110	500,000	0	12	35			110 U		120 U	110 U
Herbicides												
2,4,5-T	UG/KG	0			0	35			18 U		18 U	18 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35			14 U		14 U	14 U
2,4-D	UG/KG	0			0	35			36 U		36 U	35 U
2,4-DB	UG/KG	0			0	35			26 U		26 U	26 U
Dalapon	UG/KG	0			0	35			9.4 U		9.2 U	9.1 U
Dicamba	UG/KG	0			0	35			12 U		12 U	12 U
Dichloroprop	UG/KG	0			0	35			21 U		21 U	21 U
Dinoseb	UG/KG	0			0	35			2.9 U		2.9 U	2.8 U
MCPA	UG/KG	9,400			2	35			2,600 U		2,600 U	2,600 U
MCPP	UG/KG	0			0	35			2,500 U		2,500 U	2,400 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47	54 JN	53 JN	64 JN	120 U	56 J	60 JN
1,3-Dinitrobenzene	UG/KG	0			0	47	7.1 U	6.5 U	6.7 U	7.4 U	7.3 U	6.5 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	44 JN	41 JN	42 JN	62 J	59 J	50 JN
2,4-Dinitrotoluene	UG/KG	1,100			36	47	220	110	96 J	1,100	150	100 J
2,6-Dinitrotoluene	UG/KG	0			0	47	31 U	28 U	29 U	32 U	32 U	28 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	150 J	160 J	150 J	160	190 J	220
2-Nitrotoluene	UG/KG	0			0	31	14 U	12 U	13 U	14 U	14 U	13 U
3,5-Dinitroaniline	UG/KG	0			0	31	4 U	3.7 U	3.8 U	4.2 U	4.2 U	3.7 U
3-Nitrotoluene	UG/KG	0			0	31	9 UJ	8.2 UJ	8.6 UJ	9.4 UJ	9.3 UJ	8.3 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	160 J	180	160	120	180	220
4-Nitrotoluene	UG/KG	0			0	31	31 U	28 U	29 U	32 U	32 U	28 U
HMX	UG/KG	470			32	47	98 JN	100 J	100 J	87 JN	180 J	92 J
Nitrobenzene	UG/KG	0			0	31	25 U	23 U	24 U	26 U	26 U	23 U
Nitroglycerine	UG/KG	1,500			1	31	140 U	130 U	130 U	150 U	1,500 J	130 U
Pentaerythritol Tetranitrate	UG/KG	0			0	31	270 U	250 U	260 U	280 U	280 U	250 U
RDX	UG/KG	5,800			39	47	180	230	180	160	540 J	200 J
Tetryl	UG/KG	330			4	47	6.2 U	5.6 U	5.9 U	6.5 U	6.4 U	5.7 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01
Sample ID							S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01D
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	DU
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34			6 U		7 U	6.7 U
Aroclor-1221	UG/KG	0	1,000	0	0	34			14 U		16 U	16 U
Aroclor-1232	UG/KG	0	1,000	0	0	34			9.2 U		11 U	10 U
Aroclor-1242	UG/KG	0	1,000	0	0	34			5.8 U		6.8 U	6.5 U
Aroclor-1248	UG/KG	0	1,000	0	0	34			6.1 U		7.1 U	6.8 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34			4.7 U		5.5 U	5.3 U
Aroclor-1260	UG/KG	0	1,000	0	0	34			6 U		7 U	6.7 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34			0.2 U		1.4 J	0.22 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35			0.95 J		2 J	1.6 J
4,4'-DDT	UG/KG	3.4	47,000	0	17	34			1.1 J		1.9 J	1.2 J
Aldrin	UG/KG	0	680	0	0	34			0.28 U		0.33 U	0.31 U
Alpha-BHC	UG/KG	0	3,400	0	0	34			0.34 U		0.4 U	0.38 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34			0.21 U		0.24 U	0.24 U
Beta-BHC	UG/KG	0	3,000	0	0	34			0.33 U		0.39 U	0.37 U
Delta-BHC	UG/KG	0	500,000	0	0	34			0.32 U		0.37 U	0.36 U
Dieldrin	UG/KG	3.2	1,400	0	14	34			0.22 U		0.26 U	0.25 U
Endosulfan I	UG/KG	55	200,000	0	21	35			0.24 UJ		1.6 J	1.2 J
Endosulfan II	UG/KG	0.88	200,000	0	1	34			0.34 UJ		0.4 UJ	0.88 JN
Endosulfan sulfate	UG/KG	0	200,000	0	0	34			0.58 U		0.68 U	0.65 U
Endrin	UG/KG	3.6	89,000	0	1	34			0.84 U		1 U	0.95 U
Endrin aldehyde	UG/KG	0			0	34			0.49 U		0.57 U	0.55 U
Endrin ketone	UG/KG	0.58			1	34			0.4 U		0.47 U	0.45 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34			0.27 U		0.32 U	0.3 U
Gamma-Chlordane	UG/KG	1.1			3	34			0.75 J		0.27 U	0.26 U
Heptachlor	UG/KG	0	15,000	0	0	34			0.29 U		0.34 U	0.32 U
Heptachlor epoxide	UG/KG	0			0	34			0.22 U		0.26 U	0.25 U
Methoxychlor	UG/KG	45			1	34			0.5 U		0.58 U	0.56 U
Toxaphene	UG/KG	0			0	34			7 U		8.2 U	7.8 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	19,400	17,100	16,000	14,400	17,500	16,600
Antimony	MG/KG	5.1			32	97	0.19 UJ	0.18 UJ	0.15 UJ	0.76 UJ	0.21 UJ	1.6 J
Arsenic	MG/KG	12.6	16	0	97	97	4.7 J	4.9 J	4.9 J	4 J	5.6 J	7.3 J
Barium	MG/KG	365	400	0	97	97	222	161	160	138	176	203
Beryllium	MG/KG	1.2	590	0	95	97	0.83	0.78	0.71	0.65	0.8	0.79
Cadmium	MG/KG	1,100	9.3	11	77	95	8.6	5	4.7	4.8	**10.1**	**10.6**
Calcium	MG/KG	193,000			96	97	25,300	22,200	26,000	27,600	24,400 J	18,600
Chromium	MG/KG	446	1,500	0	97	97	32.4	25.9	25.3	22	28.8	32
Cobalt	MG/KG	26.8			97	97	12.3	12.6	11.2	9	14.2	14.9
Copper	MG/KG	7,310	270	52	97	97	**537**	209	**393**	**323**	**411 J**	**536**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	27,200	24,200	24,700	21,800	35,100	44,700
Lead	MG/KG	998	1,000	0	97	97	67.8	38.4	54.8	41.5	81.4 J	74.9
Magnesium	MG/KG	15,000			97	97	6,760	6,260	6,220	6,830	6,430	6,180
Manganese	MG/KG	5,040	10,000	0	97	97	627	653	555	458	581 J	1,080 J
Nickel	MG/KG	59.3	310	0	92	92	41.8	35	35.1	31.4	41.9	49.6
Potassium	MG/KG	4,880			76	76	2,960 R	2,550 R	2,460 R	2,310 R	2,720 R	2,430 R
Selenium	MG/KG	0.92	1,500	0	4	97	0.42 U	0.4 U	0.32 U	0.21 U	0.56 J	0.36 U
Silver	MG/KG	205	1,500	0	66	97	3.5	2.8 U	2.6	2.6	3.3	4
Sodium	MG/KG	213			81	97	125 J	115 J	106 J	116 J	114 J	103 J
Thallium	MG/KG	0.27			6	97	0.18 U	0.17 U	0.14 U	0.2 J	0.2 U	0.15 U
Vanadium	MG/KG	41.9			97	97	29.6	27.6	27.7	23.7	27.4	26.9
Zinc	MG/KG	1,470	10,000	0	92	92	321	291	356	290	369	330
Mercury	MG/KG	9.1	2.8	49	96	97	2	1.4	**6.8**	**3.4**	**3.3**	**3.6**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Sample ID							S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35				93 U		98 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35				100 U		100 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35				89 U		94 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35				98 U		100 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35				180 U		190 U
2,4,6-Trichlorophenol	UG/KG	0			0	35				180 U		190 U
2,4-Dichlorophenol	UG/KG	0			0	35				170 U		180 U
2,4-Dimethylphenol	UG/KG	0			0	35				190 U		200 U
2,4-Dinitrophenol	UG/KG	0			0	35				430 U		450 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35				97 U		100 U
2,6-Dinitrotoluene	UG/KG	700			2	35				90 U		95 U
2-Chloronaphthalene	UG/KG	0			0	35				100 U		100 U
2-Chlorophenol	UG/KG	0			0	35				190 U		200 U
2-Methylnaphthalene	UG/KG	0			0	35				100 U		110 U
2-Methylphenol	UG/KG	0	500,000	0	0	35				230 U		240 U
2-Nitroaniline	UG/KG	0			0	35				86 U		90 U
2-Nitrophenol	UG/KG	0			0	35				190 U		200 U
3 or 4-Methylphenol	UG/KG	0			0	19				210 U		220 U
3,3'-Dichlorobenzidine	UG/KG	0			0	35				130 U		140 U
3-Nitroaniline	UG/KG	0			0	35				110 U		110 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35				390 U		400 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35				97 U		100 U
4-Chloro-3-methylphenol	UG/KG	0			0	35				190 U		200 U
4-Chloroaniline	UG/KG	0			0	35				140 U		140 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35				89 U		94 U
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35				150 U		160 U
4-Nitrophenol	UG/KG	0			0	35				350 U		370 U
Acenaphthene	UG/KG	0	500,000	0	0	35				74 U		78 U
Acenaphthylene	UG/KG	30	500,000	0	3	35				80 U		84 U
Anthracene	UG/KG	18	500,000	0	2	35				96 U		100 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35				98 U		100 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35				110 U		110 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35				150 U		160 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35				120 UJ		120 UJ
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35				95 U		100 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Sample ID							S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35				110 U		120 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35				93 U		98 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19				100 U		110 U
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35				110 U		120 U
Butylbenzylphthalate	UG/KG	0			0	35				110 U		110 U
Carbazole	UG/KG	0			0	35				130 U		130 U
Chrysene	UG/KG	130	56,000	0	12	35				110 U		110 U
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35				150 U		150 U
Dibenzofuran	UG/KG	0	350,000	0	0	35				90 U		95 U
Diethyl phthalate	UG/KG	35			1	35				92 U		96 U
Dimethylphthalate	UG/KG	0			0	35				89 U		94 U
Di-n-butylphthalate	UG/KG	6,800			12	35				120 U		120 U
Di-n-octylphthalate	UG/KG	0			0	35				240 U		250 U
Fluoranthene	UG/KG	68	500,000	0	11	35				120 U		130 U
Fluorene	UG/KG	0	500,000	0	0	35				93 U		98 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35				94 U		99 U
Hexachlorobutadiene	UG/KG	0			0	35				95 U		100 U
Hexachlorocyclopentadiene	UG/KG	0			0	35				94 U		99 U
Hexachloroethane	UG/KG	1,100			6	35				110 U		120 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35				140 U		150 U
Isophorone	UG/KG	0			0	35				86 U		90 U
Naphthalene	UG/KG	30	500,000	0	5	35				100 U		100 U
Nitrobenzene	UG/KG	0			0	35				100 U		110 U
N-Nitrosodiphenylamine	UG/KG	320			2	35				250 U		260 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35				95 U		100 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35				270 UJ		280 UJ
Phenanthrene	UG/KG	46	500,000	0	9	35				95 U		100 U
Phenol	UG/KG	0	500,000	0	0	35				180 U		190 U
Pyrene	UG/KG	110	500,000	0	12	35				120 U		120 U
Herbicides												
2,4,5-T	UG/KG	0			0	35				17 U		19 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35				13 U		15 U
2,4-D	UG/KG	0			0	35				34 U		38 U
2,4-DB	UG/KG	0			0	35				25 U		28 U
Dalapon	UG/KG	0			0	35				8.7 U		9.7 U
Dicamba	UG/KG	0			0	35				12 U		13 U
Dichloroprop	UG/KG	0			0	35				20 U		22 U
Dinoseb	UG/KG	0			0	35				2.7 U		3 U
MCPA	UG/KG	9,400			2	35				2,400 U		2,700 U
MCPP	UG/KG	0			0	35				2,300 U		2,600 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47	100 U	79 JN	49 JN	62 JN	57 JN	46 J
1,3-Dinitrobenzene	UG/KG	0			0	47	6.5 U	6 U	6.1 U	7.5 U	6.8 U	7.2 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	51 J	29 JN	36 JN	45 JN	40 JN	39 JN
2,4-Dinitrotoluene	UG/KG	1,100			36	47	220	99	120	83 J	100 J	64 J
2,6-Dinitrotoluene	UG/KG	0			0	47	28 U	26 U	26 U	33 U	29 U	31 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	130 J	130 J	140	160 J	160 J	99 J
2-Nitrotoluene	UG/KG	0			0	31	13 U	12 U	12 U	14 U	13 U	14 U
3,5-Dinitroaniline	UG/KG	0			0	31	3.7 U	3.4 U	3.5 U	4.3 U	3.8 U	4.1 U
3-Nitrotoluene	UG/KG	0			0	31	8.3 U	7.7 UJ	7.8 UJ	9.6 UJ	8.6 UJ	9.1 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	120	130	140	150 J	160 J	94 J
4-Nitrotoluene	UG/KG	0			0	31	28 U	26 U	26 U	33 U	29 U	31 U
HMX	UG/KG	470			32	47	68 JN	100 J	120 J	110 JN	120 J	120 U
Nitrobenzene	UG/KG	0			0	31	23 U	21 U	22 U	27 U	24 U	25 U
Nitroglycerine	UG/KG	1,500			1	31	130 U	120 U	120 U	150 U	140 U	140 U
Pentaerythritol Tetranitrate	UG/KG	0			0	31	250 U	230 U	240 U	290 U	260 U	280 U
RDX	UG/KG	5,800			39	47	140	180	220	210	210	120 J
Tetryl	UG/KG	330			4	47	5.7 U	5.3 U	5.3 U	6.6 U	5.9 U	6.2 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Sample ID							S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
							Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34				6.6 U		7.2 U
Aroclor-1221	UG/KG	0	1,000	0	0	34				15 U		17 U
Aroclor-1232	UG/KG	0	1,000	0	0	34				10 U		11 U
Aroclor-1242	UG/KG	0	1,000	0	0	34				6.4 U		7 U
Aroclor-1248	UG/KG	0	1,000	0	0	34				6.8 U		7.3 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34				**2,000**		5.6 U
Aroclor-1260	UG/KG	0	1,000	0	0	34				6.6 U		7.2 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34				0.22 U		0.24 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35				0.21 U		0.89 J
4,4'-DDT	UG/KG	3.4	47,000	0	17	34				0.34 U		0.88 J
Aldrin	UG/KG	0	680	0	0	34				0.31 U		0.34 U
Alpha-BHC	UG/KG	0	3,400	0	0	34				0.38 U		0.41 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34				0.23 U		0.25 U
Beta-BHC	UG/KG	0	3,000	0	0	34				0.36 U		0.4 U
Delta-BHC	UG/KG	0	500,000	0	0	34				0.35 U		0.38 U
Dieldrin	UG/KG	3.2	1,400	0	14	34				0.24 U		0.84 J
Endosulfan I	UG/KG	55	200,000	0	21	35				0.26 UJ		0.79 J
Endosulfan II	UG/KG	0.88	200,000	0	1	34				0.38 UJ		0.41 UJ
Endosulfan sulfate	UG/KG	0	200,000	0	0	34				0.64 U		0.7 U
Endrin	UG/KG	3.6	89,000	0	1	34				0.94 U		1 U
Endrin aldehyde	UG/KG	0			0	34				0.54 U		0.59 U
Endrin ketone	UG/KG	0.58			1	34				0.44 U		0.48 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34				0.3 U		0.32 U
Gamma-Chlordane	UG/KG	1.1			3	34				0.25 U		0.28 U
Heptachlor	UG/KG	0	15,000	0	0	34				0.32 U		0.35 U
Heptachlor epoxide	UG/KG	0			0	34				0.24 U		0.26 U
Methoxychlor	UG/KG	45			1	34				45		0.6 U
Toxaphene	UG/KG	0			0	34				7.7 U		8.4 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	18,000	17,500	17,200	15,000	19,400	18,000
Antimony	MG/KG	5.1			32	97	1.3 UJ	0.19 UJ	0.2 UJ	0.47 UJ	0.2 UJ	0.19 UJ
Arsenic	MG/KG	12.6	16	0	97	97	5.3 J	12.4 J	11 J	12.6 J	5.6 J	4.6 J
Barium	MG/KG	365	400	0	97	97	150	190	179	220	194	163
Beryllium	MG/KG	1.2	590	0	95	97	0.79	0.78	0.77	0.67	0.86	0.8
Cadmium	MG/KG	1,100	9.3	11	77	95	7.4	8.7	8.6	**1,100**	7.5	6.9
Calcium	MG/KG	193,000			96	97	22,900	26,600	43,900	23,200	23,400	25,500
Chromium	MG/KG	446	1,500	0	97	97	30	29.9	29.8	37.8	29.7	28
Cobalt	MG/KG	26.8			97	97	12.7	12	12.9	14	12.3	11.9
Copper	MG/KG	7,310	270	52	97	97	**434**	**433**	**477**	**1,780**	**411**	**4,180**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	27,900	34,200	29,600	118,000	27,200	24,700
Lead	MG/KG	998	1,000	0	97	97	50.8	56.3	59.9	57.2	61.9	217
Magnesium	MG/KG	15,000			97	97	7,310	6,720	6,410	5,680	7,010	7,190
Manganese	MG/KG	5,040	10,000	0	97	97	580	610	642	648	618	582
Nickel	MG/KG	59.3	310	0	92	92	41.3	41.2	39.5	46.2	41.2	37
Potassium	MG/KG	4,880			76	76	2,580 R	2,850 R	2,850 R	2,160 R	3,410 R	3,190 R
Selenium	MG/KG	0.92	1,500	0	4	97	0.35 U	0.42 U	0.45 U	1.03 U	0.44 U	0.41 U
Silver	MG/KG	205	1,500	0	66	97	3.8	3.4	4	205	3.2	2.8 U
Sodium	MG/KG	213			81	97	107 J	110 J	110 J	103 J	116 J	121 J
Thallium	MG/KG	0.27			6	97	0.15 U	0.18 U	0.19 U	0.44 U	0.19 U	0.17 U
Vanadium	MG/KG	41.9			97	97	28.7	28.5	28.7	24.4	31.7	29.4
Zinc	MG/KG	1,470	10,000	0	92	92	299	327	368	1,270	337	319
Mercury	MG/KG	9.1	2.8	49	96	97	**3.5**	**4.3**	**4.3**	**3.1**	**4.3**	**3.6**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Sample ID							S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/16/2010	3/16/2010	3/16/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35		93 U				
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35		100 U				
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35		89 U				
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35		98 U				
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35		180 U				
2,4,6-Trichlorophenol	UG/KG	0			0	35		180 U				
2,4-Dichlorophenol	UG/KG	0			0	35		170 U				
2,4-Dimethylphenol	UG/KG	0			0	35		190 U				
2,4-Dinitrophenol	UG/KG	0			0	35		430 U				
2,4-Dinitrotoluene	UG/KG	14,000			13	35		97 U				
2,6-Dinitrotoluene	UG/KG	700			2	35		90 U				
2-Chloronaphthalene	UG/KG	0			0	35		99 U				
2-Chlorophenol	UG/KG	0			0	35		190 U				
2-Methylnaphthalene	UG/KG	0			0	35		100 U				
2-Methylphenol	UG/KG	0	500,000	0	0	35		230 U				
2-Nitroaniline	UG/KG	0			0	35		86 U				
2-Nitrophenol	UG/KG	0			0	35		190 U				
3 or 4-Methylphenol	UG/KG	0			0	19		210 U				
3,3'-Dichlorobenzidine	UG/KG	0			0	35		130 U				
3-Nitroaniline	UG/KG	0			0	35		110 U				
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35		380 U				
4-Bromophenyl phenyl ether	UG/KG	0			0	35		97 U				
4-Chloro-3-methylphenol	UG/KG	0			0	35		190 U				
4-Chloroaniline	UG/KG	0			0	35		140 U				
4-Chlorophenyl phenyl ether	UG/KG	0			0	35		89 U				
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35		150 U				
4-Nitrophenol	UG/KG	0			0	35		350 U				
Acenaphthene	UG/KG	0	500,000	0	0	35		74 U				
Acenaphthylene	UG/KG	30	500,000	0	3	35		80 U				
Anthracene	UG/KG	18	500,000	0	2	35		96 U				
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35		98 U				
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35		110 U				
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35		150 U				
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35		120 UJ				
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35		95 U				

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Sample ID							S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/16/2010	3/16/2010	3/16/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35		110 U				
Bis(2-Chloroethyl)ether	UG/KG	0			0	35		93 U				
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19		100 U				
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35		110 U				
Butylbenzylphthalate	UG/KG	0			0	35		110 U				
Carbazole	UG/KG	0			0	35		130 U				
Chrysene	UG/KG	130	56,000	0	12	35		130 J				
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35		150 U				
Dibenzofuran	UG/KG	0	350,000	0	0	35		90 U				
Diethyl phthalate	UG/KG	35			1	35		91 U				
Dimethylphthalate	UG/KG	0			0	35		89 U				
Di-n-butylphthalate	UG/KG	6,800			12	35		120 U				
Di-n-octylphthalate	UG/KG	0			0	35		240 U				
Fluoranthene	UG/KG	68	500,000	0	11	35		120 U				
Fluorene	UG/KG	0	500,000	0	0	35		93 U				
Hexachlorobenzene	UG/KG	110	6,000	0	11	35		94 U				
Hexachlorobutadiene	UG/KG	0			0	35		95 U				
Hexachlorocyclopentadiene	UG/KG	0			0	35		94 U				
Hexachloroethane	UG/KG	1,100			6	35		110 U				
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35		140 U				
Isophorone	UG/KG	0			0	35		86 U				
Naphthalene	UG/KG	30	500,000	0	5	35		99 U				
Nitrobenzene	UG/KG	0			0	35		100 U				
N-Nitrosodiphenylamine	UG/KG	320			2	35		250 U				
N-Nitrosodipropylamine	UG/KG	1,600			5	35		95 U				
Pentachlorophenol	UG/KG	0	6,700	0	0	35		270 UJ				
Phenanthrene	UG/KG	46	500,000	0	9	35		95 U				
Phenol	UG/KG	0	500,000	0	0	35		180 U				
Pyrene	UG/KG	110	500,000	0	12	35		120 U				
Herbicides												
2,4,5-T	UG/KG	0			0	35		17 U				
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35		14 U				
2,4-D	UG/KG	0			0	35		35 U				
2,4-DB	UG/KG	0			0	35		25 U				
Dalapon	UG/KG	0			0	35		9 U				
Dicamba	UG/KG	0			0	35		12 U				
Dichloroprop	UG/KG	0			0	35		20 U				
Dinoseb	UG/KG	0			0	35		2.8 UJ				
MCPA	UG/KG	9,400			2	35		2,500 U				
MCPP	UG/KG	0			0	35		2,400 U				
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47	65 JN	60 JN	68 J			
1,3-Dinitrobenzene	UG/KG	0			0	47	7.7 U	5.7 U	7.1 U			
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	49 JN	51 J	47 J			
2,4-Dinitrotoluene	UG/KG	1,100			36	47	91 J	86 J	110 J			
2,6-Dinitrotoluene	UG/KG	0			0	47	34 U	25 U	31 U			
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	190 J	180	220			
2-Nitrotoluene	UG/KG	0			0	31	15 U	11 U	14 U			
3,5-Dinitroaniline	UG/KG	0			0	31	4.4 U	3.2 U	4 U			
3-Nitrotoluene	UG/KG	0			0	31	9.8 UJ	7.2 UJ	9 UJ			
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	160 J	160	220			
4-Nitrotoluene	UG/KG	0			0	31	34 U	25 U	31 U			
HMX	UG/KG	470			32	47	150 J	150	190			
Nitrobenzene	UG/KG	0			0	31	27 U	20 U	25 U			
Nitroglycerine	UG/KG	1,500			1	31	150 U	110 U	140 U			
Pentaerythritol Tetranitrate	UG/KG	0			0	31	300 U	220 U	270 U			
RDX	UG/KG	5,800			39	47	310	340	420			
Tetryl	UG/KG	330			4	47	6.7 U	5 U	6.2 U			

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Sample ID							S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/16/2010	3/16/2010	3/16/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34		7 U				
Aroclor-1221	UG/KG	0	1,000	0	0	34		16 U				
Aroclor-1232	UG/KG	0	1,000	0	0	34		11 U				
Aroclor-1242	UG/KG	0	1,000	0	0	34		6.8 U				
Aroclor-1248	UG/KG	0	1,000	0	0	34		7.2 U				
Aroclor-1254	UG/KG	2,000	1,000	1	2	34		5.5 U				
Aroclor-1260	UG/KG	0	1,000	0	0	34		7 U				
4,4'-DDD	UG/KG	2.4	92,000	0	2	34		0.23 U				
4,4'-DDE	UG/KG	4.2	62,000	0	22	35		1.1 J				
4,4'-DDT	UG/KG	3.4	47,000	0	17	34		1.1 J				
Aldrin	UG/KG	0	680	0	0	34		0.33 U				
Alpha-BHC	UG/KG	0	3,400	0	0	34		0.4 U				
Alpha-Chlordane	UG/KG	2	24,000	0	4	34		0.25 U				
Beta-BHC	UG/KG	0	3,000	0	0	34		0.39 U				
Delta-BHC	UG/KG	0	500,000	0	0	34		0.38 U				
Dieldrin	UG/KG	3.2	1,400	0	14	34		0.87 J				
Endosulfan I	UG/KG	55	200,000	0	21	35		1 J				
Endosulfan II	UG/KG	0.88	200,000	0	1	34		0.4 UJ				
Endosulfan sulfate	UG/KG	0	200,000	0	0	34		0.68 U				
Endrin	UG/KG	3.6	89,000	0	1	34		1 U				
Endrin aldehyde	UG/KG	0			0	34		0.57 U				
Endrin ketone	UG/KG	0.58			1	34		0.47 U				
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34		0.32 U				
Gamma-Chlordane	UG/KG	1.1			3	34		0.27 U				
Heptachlor	UG/KG	0	15,000	0	0	34		0.34 U				
Heptachlor epoxide	UG/KG	0			0	34		0.26 U				
Methoxychlor	UG/KG	45			1	34		0.59 U				
Toxaphene	UG/KG	0			0	34		8.2 U				
Inorganics												
Aluminum	MG/KG	27,900			97	97	22,200	17,700	20,300	20,700	22,100	18,100
Antimony	MG/KG	5.1			32	97	0.28 J	0.2 UJ	0.22 UJ	0.12 UJ	0.13 UJ	0.88 J
Arsenic	MG/KG	12.6	16	0	97	97	4.8 J	4.9 J	5.5 J	5.3	5.1	5.1
Barium	MG/KG	365	400	0	97	97	174	187	266	141 J	109 J	167 J
Beryllium	MG/KG	1.2	590	0	95	97	0.82	0.81	0.88	0.87 J	0.88 J	0.8 J
Cadmium	MG/KG	1,100	9.3	11	77	95	8	8.9	8	1 J	1.3 U	1.8
Calcium	MG/KG	193,000			96	97	24,500	23,300	22,800	3,790 J	2,750 J	27,800 J
Chromium	MG/KG	446	1,500	0	97	97	40.8	30.9	30.8	24.1 J	29.6 J	31.4 J
Cobalt	MG/KG	26.8			97	97	10.6	14	12.4	8.9 J	9.9 J	12.4 J
Copper	MG/KG	7,310	270	52	97	97	**648**	**442**	**490**	32.8	47.2 J	92.6 J
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	25,900	28,000	27,700	22,500 J	24,900 J	28,300 J
Lead	MG/KG	998	1,000	0	97	97	59.3	61.2	62.5	19.4 J	46.4	123
Magnesium	MG/KG	15,000			97	97	6,420	6,870	7,090	4,320 J	4,480 J	7,560 J
Manganese	MG/KG	5,040	10,000	0	97	97	557	710	601	682 J	256 J	437 J
Nickel	MG/KG	59.3	310	0	92	92	36.1	43.4	40.9	23.5 J	32.2 J	49.7 J
Potassium	MG/KG	4,880			76	76	3,200 R	2,700 R	3,440 R	2,920 J	3,400 J	2,950 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.23 U	0.45 U	0.73 J	0.26 U	0.28 U	0.38 U
Silver	MG/KG	205	1,500	0	66	97	3.8	3.4	4	0.08 U	0.18 J	0.11 U
Sodium	MG/KG	213			81	97	120 J	110 J	135 J	138	130 U	126
Thallium	MG/KG	0.27			6	97	0.1 U	0.19 U	0.2 U	0.11 U	1.9 U	2.6 U
Vanadium	MG/KG	41.9			97	97	28.4	27.8	32.5	33.3 J	37.8 J	26.9 J
Zinc	MG/KG	1,470	10,000	0	92	92	433	356	357	85.6 J	140 J	185 J
Mercury	MG/KG	9.1	2.8	49	96	97	**6**	**3**	**3.6**	0.38	0.28	0.79

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R10-03	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Sample ID							S45-R10-03D	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	4/1/2010
QC Type							DU	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35						
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35						
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35						
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35						
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35						
2,4,6-Trichlorophenol	UG/KG	0			0	35						
2,4-Dichlorophenol	UG/KG	0			0	35						
2,4-Dimethylphenol	UG/KG	0			0	35						
2,4-Dinitrophenol	UG/KG	0			0	35						
2,4-Dinitrotoluene	UG/KG	14,000			13	35						
2,6-Dinitrotoluene	UG/KG	700			2	35						
2-Chloronaphthalene	UG/KG	0			0	35						
2-Chlorophenol	UG/KG	0			0	35						
2-Methylnaphthalene	UG/KG	0			0	35						
2-Methylphenol	UG/KG	0	500,000	0	0	35						
2-Nitroaniline	UG/KG	0			0	35						
2-Nitrophenol	UG/KG	0			0	35						
3 or 4-Methylphenol	UG/KG	0			0	19						
3,3'-Dichlorobenzidine	UG/KG	0			0	35						
3-Nitroaniline	UG/KG	0			0	35						
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35						
4-Bromophenyl phenyl ether	UG/KG	0			0	35						
4-Chloro-3-methylphenol	UG/KG	0			0	35						
4-Chloroaniline	UG/KG	0			0	35						
4-Chlorophenyl phenyl ether	UG/KG	0			0	35						
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35						
4-Nitrophenol	UG/KG	0			0	35						
Acenaphthene	UG/KG	0	500,000	0	0	35						
Acenaphthylene	UG/KG	30	500,000	0	3	35						
Anthracene	UG/KG	18	500,000	0	2	35						
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35						
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35						
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35						
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35						
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R10-03	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Sample ID							S45-R10-03D	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	4/1/2010
QC Type							DU	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35						
Bis(2-Chloroethyl)ether	UG/KG	0			0	35						
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19						
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35						
Butylbenzylphthalate	UG/KG	0			0	35						
Carbazole	UG/KG	0			0	35						
Chrysene	UG/KG	130	56,000	0	12	35						
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35						
Dibenzofuran	UG/KG	0	350,000	0	0	35						
Diethyl phthalate	UG/KG	35			1	35						
Dimethylphthalate	UG/KG	0			0	35						
Di-n-butylphthalate	UG/KG	6,800			12	35						
Di-n-octylphthalate	UG/KG	0			0	35						
Fluoranthene	UG/KG	68	500,000	0	11	35						
Fluorene	UG/KG	0	500,000	0	0	35						
Hexachlorobenzene	UG/KG	110	6,000	0	11	35						
Hexachlorobutadiene	UG/KG	0			0	35						
Hexachlorocyclopentadiene	UG/KG	0			0	35						
Hexachloroethane	UG/KG	1,100			6	35						
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35						
Isophorone	UG/KG	0			0	35						
Naphthalene	UG/KG	30	500,000	0	5	35						
Nitrobenzene	UG/KG	0			0	35						
N-Nitrosodiphenylamine	UG/KG	320			2	35						
N-Nitrosodipropylamine	UG/KG	1,600			5	35						
Pentachlorophenol	UG/KG	0	6,700	0	0	35						
Phenanthrene	UG/KG	46	500,000	0	9	35						
Phenol	UG/KG	0	500,000	0	0	35						
Pyrene	UG/KG	110	500,000	0	12	35						
Herbicides												
2,4,5-T	UG/KG	0			0	35						
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35						
2,4-D	UG/KG	0			0	35						
2,4-DB	UG/KG	0			0	35						
Dalapon	UG/KG	0			0	35						
Dicamba	UG/KG	0			0	35						
Dichloroprop	UG/KG	0			0	35						
Dinoseb	UG/KG	0			0	35						
MCPA	UG/KG	9,400			2	35						
MCPP	UG/KG	0			0	35						
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47						
1,3-Dinitrobenzene	UG/KG	0			0	47						
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47						
2,4-Dinitrotoluene	UG/KG	1,100			36	47						
2,6-Dinitrotoluene	UG/KG	0			0	47						
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47						
2-Nitrotoluene	UG/KG	0			0	31						
3,5-Dinitroaniline	UG/KG	0			0	31						
3-Nitrotoluene	UG/KG	0			0	31						
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47						
4-Nitrotoluene	UG/KG	0			0	31						
HMX	UG/KG	470			32	47						
Nitrobenzene	UG/KG	0			0	31						
Nitroglycerine	UG/KG	1,500			1	31						
Pentaerythritol Tetranitrate	UG/KG	0			0	31						
RDX	UG/KG	5,800			39	47						
Tetryl	UG/KG	330			4	47						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R10-03	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Sample ID							S45-R10-03D	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	4/1/2010
QC Type							DU	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34						
Aroclor-1221	UG/KG	0	1,000	0	0	34						
Aroclor-1232	UG/KG	0	1,000	0	0	34						
Aroclor-1242	UG/KG	0	1,000	0	0	34						
Aroclor-1248	UG/KG	0	1,000	0	0	34						
Aroclor-1254	UG/KG	2,000	1,000	1	2	34						
Aroclor-1260	UG/KG	0	1,000	0	0	34						
4,4'-DDD	UG/KG	2.4	92,000	0	2	34						
4,4'-DDE	UG/KG	4.2	62,000	0	22	35						
4,4'-DDT	UG/KG	3.4	47,000	0	17	34						
Aldrin	UG/KG	0	680	0	0	34						
Alpha-BHC	UG/KG	0	3,400	0	0	34						
Alpha-Chlordane	UG/KG	2	24,000	0	4	34						
Beta-BHC	UG/KG	0	3,000	0	0	34						
Delta-BHC	UG/KG	0	500,000	0	0	34						
Dieldrin	UG/KG	3.2	1,400	0	14	34						
Endosulfan I	UG/KG	55	200,000	0	21	35						
Endosulfan II	UG/KG	0.88	200,000	0	1	34						
Endosulfan sulfate	UG/KG	0	200,000	0	0	34						
Endrin	UG/KG	3.6	89,000	0	1	34						
Endrin aldehyde	UG/KG	0			0	34						
Endrin ketone	UG/KG	0.58			1	34						
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34						
Gamma-Chlordane	UG/KG	1.1			3	34						
Heptachlor	UG/KG	0	15,000	0	0	34						
Heptachlor epoxide	UG/KG	0			0	34						
Methoxychlor	UG/KG	45			1	34						
Toxaphene	UG/KG	0			0	34						
Inorganics												
Aluminum	MG/KG	27,900			97	97	16,700	19,100	19,900	17,400	16,500	17,200
Antimony	MG/KG	5.1			32	97	2.4	0.09 UJ	0.14 UJ	0.11 UJ	1.8 J	0.52 J
Arsenic	MG/KG	12.6	16	0	97	97	5	4.8	4.6	4	4.5	5.9
Barium	MG/KG	365	400	0	97	97	256 J	108 J	134 J	107 J	263 J	259
Beryllium	MG/KG	1.2	590	0	95	97	0.76 J	0.77 J	0.86 J	0.68 J	0.76 J	0.75
Cadmium	MG/KG	1,100	9.3	11	77	95	1.6 U	0.96 U	1.4 U	1.2 U	1.6 U	7.6
Calcium	MG/KG	193,000			96	97	28,500 J	2,840 J	4,100 J	3,700 J	14,500 J	23,200
Chromium	MG/KG	446	1,500	0	97	97	29.2 J	23.9 J	25.5 J	22.4 J	29.2 J	35.3
Cobalt	MG/KG	26.8			97	97	12.5 J	10.5 J	9.6 J	7.7 J	12.1 J	12.2
Copper	MG/KG	7,310	270	52	97	97	132	24.9 J	44.7 J	64 J	129 J	**475**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	28,800 J	21,900 J	22,700 J	20,500 J	27,500 J	31,400
Lead	MG/KG	998	1,000	0	97	97	189	21.7	25.2	35.4	198	54.7
Magnesium	MG/KG	15,000			97	97	6,880 J	3,630 J	4,050 J	3,650 J	6,640 J	6,460
Manganese	MG/KG	5,040	10,000	0	97	97	436 J	999 J	627 J	446 J	393 J	657
Nickel	MG/KG	59.3	310	0	92	92	46.9 J	21.6 J	27.1 J	21.4 J	47.4 J	43
Potassium	MG/KG	4,880			76	76	2,610 J	2,580 J	3,250 J	2,320 J	2,400 J	2,590
Selenium	MG/KG	0.92	1,500	0	4	97	0.34 U	0.21 U	0.3 U	0.25 U	0.92 J	1.7 U
Silver	MG/KG	205	1,500	0	66	97	0.1 U	0.06 U	0.09 U	0.08 U	0.11 U	4.4
Sodium	MG/KG	213			81	97	110	96 U	140 U	120 U	97.1	86 U
Thallium	MG/KG	0.27			6	97	0.14 U	0.09 U	0.13 U	0.11 U	2.4 U	0.28 U
Vanadium	MG/KG	41.9			97	97	25.3 J	32.4 J	33 J	29.6 J	24.5 J	28.5
Zinc	MG/KG	1,470	10,000	0	92	92	298	85.7 J	130 J	136 J	237 J	319
Mercury	MG/KG	9.1	2.8	49	96	97	1	0.17	0.45	0.71	0.38	**5.5**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Sample ID							S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/15/2010	3/16/2010
QC Type							SA	SA	SA	DU	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35						
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35						
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35						
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35						
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35						
2,4,6-Trichlorophenol	UG/KG	0			0	35						
2,4-Dichlorophenol	UG/KG	0			0	35						
2,4-Dimethylphenol	UG/KG	0			0	35						
2,4-Dinitrophenol	UG/KG	0			0	35						
2,4-Dinitrotoluene	UG/KG	14,000			13	35						
2,6-Dinitrotoluene	UG/KG	700			2	35						
2-Chloronaphthalene	UG/KG	0			0	35						
2-Chlorophenol	UG/KG	0			0	35						
2-Methylnaphthalene	UG/KG	0			0	35						
2-Methylphenol	UG/KG	0	500,000	0	0	35						
2-Nitroaniline	UG/KG	0			0	35						
2-Nitrophenol	UG/KG	0			0	35						
3 or 4-Methylphenol	UG/KG	0			0	19						
3,3'-Dichlorobenzidine	UG/KG	0			0	35						
3-Nitroaniline	UG/KG	0			0	35						
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35						
4-Bromophenyl phenyl ether	UG/KG	0			0	35						
4-Chloro-3-methylphenol	UG/KG	0			0	35						
4-Chloroaniline	UG/KG	0			0	35						
4-Chlorophenyl phenyl ether	UG/KG	0			0	35						
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35						
4-Nitrophenol	UG/KG	0			0	35						
Acenaphthene	UG/KG	0	500,000	0	0	35						
Acenaphthylene	UG/KG	30	500,000	0	3	35						
Anthracene	UG/KG	18	500,000	0	2	35						
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35						
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35						
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35						
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35						
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed						
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Sample ID							S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/15/2010	3/16/2010
QC Type							SA	SA	SA	DU	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
							Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35						
Bis(2-Chloroethyl)ether	UG/KG	0			0	35						
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19						
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35						
Butylbenzylphthalate	UG/KG	0			0	35						
Carbazole	UG/KG	0			0	35						
Chrysene	UG/KG	130	56,000	0	12	35						
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35						
Dibenzofuran	UG/KG	0	350,000	0	0	35						
Diethyl phthalate	UG/KG	35			1	35						
Dimethylphthalate	UG/KG	0			0	35						
Di-n-butylphthalate	UG/KG	6,800			12	35						
Di-n-octylphthalate	UG/KG	0			0	35						
Fluoranthene	UG/KG	68	500,000	0	11	35						
Fluorene	UG/KG	0	500,000	0	0	35						
Hexachlorobenzene	UG/KG	110	6,000	0	11	35						
Hexachlorobutadiene	UG/KG	0			0	35						
Hexachlorocyclopentadiene	UG/KG	0			0	35						
Hexachloroethane	UG/KG	1,100			6	35						
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35						
Isophorone	UG/KG	0			0	35						
Naphthalene	UG/KG	30	500,000	0	5	35						
Nitrobenzene	UG/KG	0			0	35						
N-Nitrosodiphenylamine	UG/KG	320			2	35						
N-Nitrosodipropylamine	UG/KG	1,600			5	35						
Pentachlorophenol	UG/KG	0	6,700	0	0	35						
Phenanthrene	UG/KG	46	500,000	0	9	35						
Phenol	UG/KG	0	500,000	0	0	35						
Pyrene	UG/KG	110	500,000	0	12	35						
Herbicides												
2,4,5-T	UG/KG	0			0	35						
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35						
2,4-D	UG/KG	0			0	35						
2,4-DB	UG/KG	0			0	35						
Dalapon	UG/KG	0			0	35						
Dicamba	UG/KG	0			0	35						
Dichloroprop	UG/KG	0			0	35						
Dinoseb	UG/KG	0			0	35						
MCPA	UG/KG	9,400			2	35						
MCPP	UG/KG	0			0	35						
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47						
1,3-Dinitrobenzene	UG/KG	0			0	47						
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47						
2,4-Dinitrotoluene	UG/KG	1,100			36	47						
2,6-Dinitrotoluene	UG/KG	0			0	47						
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47						
2-Nitrotoluene	UG/KG	0			0	31						
3,5-Dinitroaniline	UG/KG	0			0	31						
3-Nitrotoluene	UG/KG	0			0	31						
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47						
4-Nitrotoluene	UG/KG	0			0	31						
HMX	UG/KG	470			32	47						
Nitrobenzene	UG/KG	0			0	31						
Nitroglycerine	UG/KG	1,500			1	31						
Pentaerythritol Tetranitrate	UG/KG	0			0	31						
RDX	UG/KG	5,800			39	47						
Tetryl	UG/KG	330			4	47						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Sample ID							S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/15/2010	3/16/2010
QC Type							SA	SA	SA	DU	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34						
Aroclor-1221	UG/KG	0	1,000	0	0	34						
Aroclor-1232	UG/KG	0	1,000	0	0	34						
Aroclor-1242	UG/KG	0	1,000	0	0	34						
Aroclor-1248	UG/KG	0	1,000	0	0	34						
Aroclor-1254	UG/KG	2,000	1,000	1	2	34						
Aroclor-1260	UG/KG	0	1,000	0	0	34						
4,4'-DDD	UG/KG	2.4	92,000	0	2	34						
4,4'-DDE	UG/KG	4.2	62,000	0	22	35						
4,4'-DDT	UG/KG	3.4	47,000	0	17	34						
Aldrin	UG/KG	0	680	0	0	34						
Alpha-BHC	UG/KG	0	3,400	0	0	34						
Alpha-Chlordane	UG/KG	2	24,000	0	4	34						
Beta-BHC	UG/KG	0	3,000	0	0	34						
Delta-BHC	UG/KG	0	500,000	0	0	34						
Dieldrin	UG/KG	3.2	1,400	0	14	34						
Endosulfan I	UG/KG	55	200,000	0	21	35						
Endosulfan II	UG/KG	0.88	200,000	0	1	34						
Endosulfan sulfate	UG/KG	0	200,000	0	0	34						
Endrin	UG/KG	3.6	89,000	0	1	34						
Endrin aldehyde	UG/KG	0			0	34						
Endrin ketone	UG/KG	0.58			1	34						
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34						
Gamma-Chlordane	UG/KG	1.1			3	34						
Heptachlor	UG/KG	0	15,000	0	0	34						
Heptachlor epoxide	UG/KG	0			0	34						
Methoxychlor	UG/KG	45			1	34						
Toxaphene	UG/KG	0			0	34						
Inorganics												
Aluminum	MG/KG	27,900			97	97	16,200	18,200	16,800	20,200	19,900	25,000
Antimony	MG/KG	5.1			32	97	0.64 J	0.65 J	0.81 J	0.37 J	0.25 UJ	0.12 UJ
Arsenic	MG/KG	12.6	16	0	97	97	5.1	5.5	4.9	5.5	7.6	5.4
Barium	MG/KG	365	400	0	97	97	150	168	161	182	287 J	175 J
Beryllium	MG/KG	1.2	590	0	95	97	0.72	0.81	0.89 U	0.85	1 J	1 J
Cadmium	MG/KG	1,100	9.3	11	77	95	7.7	8.2	7.9	8.1	2.6 U	1.2 U
Calcium	MG/KG	193,000			96	97	26,900	21,700	40,600 U	22,000	3,630 J	4,370 J
Chromium	MG/KG	446	1,500	0	97	97	27.4	30.3	27	30.7	24.6 J	30.8 J
Cobalt	MG/KG	26.8			97	97	12.3	12.7	11.4	12.2	26.8 J	10 J
Copper	MG/KG	7,310	270	52	97	97	**794**	**478**	**467**	**433**	22.8 J	25.6 J
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	25,200	25,800	26,700	28,100	35,300 J	26,200 J
Lead	MG/KG	998	1,000	0	97	97	69.2	62.2	63.8	58	22	26.6
Magnesium	MG/KG	15,000			97	97	7,910	6,520	6,890	6,920	4,080 J	4,460 J
Manganese	MG/KG	5,040	10,000	0	97	97	676	664	557	561	5,040 J	552 J
Nickel	MG/KG	59.3	310	0	92	92	39.6	41.8	37	40.5	29.8 J	27.1 J
Potassium	MG/KG	4,880			76	76	2,450	2,690	2,600	3,370	2,780 J	3,850 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.7 U	0.75 U	0.7 U	0.85 U	0.56 U	0.27 U
Silver	MG/KG	205	1,500	0	66	97	3.2	4	3.9	3.2 J	0.17 U	0.08 U
Sodium	MG/KG	213			81	97	89 U	95.6	93.3	86.8 J	130 U	120 U
Thallium	MG/KG	0.27			6	97	0.29 U	0.32 U	0.3 U	0.36 U	0.24 U	0.12 U
Vanadium	MG/KG	41.9			97	97	27.3	29.8	28.3	32.8	30.7 J	41.9 J
Zinc	MG/KG	1,470	10,000	0	92	92	1,350	328	404	347	101 J	104 J
Mercury	MG/KG	9.1	2.8	49	96	97	**3.5**	**3.5**	**3.1**	**4.4**	0.21	0.1

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Sample ID							S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/17/2010	3/15/2010	3/15/2010	3/15/2010	4/1/2010	4/1/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35						
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35						
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35						
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35						
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35						
2,4,6-Trichlorophenol	UG/KG	0			0	35						
2,4-Dichlorophenol	UG/KG	0			0	35						
2,4-Dimethylphenol	UG/KG	0			0	35						
2,4-Dinitrophenol	UG/KG	0			0	35						
2,4-Dinitrotoluene	UG/KG	14,000			13	35						
2,6-Dinitrotoluene	UG/KG	700			2	35						
2-Chloronaphthalene	UG/KG	0			0	35						
2-Chlorophenol	UG/KG	0			0	35						
2-Methylnaphthalene	UG/KG	0			0	35						
2-Methylphenol	UG/KG	0	500,000	0	0	35						
2-Nitroaniline	UG/KG	0			0	35						
2-Nitrophenol	UG/KG	0			0	35						
3 or 4-Methylphenol	UG/KG	0			0	19						
3,3'-Dichlorobenzidine	UG/KG	0			0	35						
3-Nitroaniline	UG/KG	0			0	35						
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35						
4-Bromophenyl phenyl ether	UG/KG	0			0	35						
4-Chloro-3-methylphenol	UG/KG	0			0	35						
4-Chloroaniline	UG/KG	0			0	35						
4-Chlorophenyl phenyl ether	UG/KG	0			0	35						
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35						
4-Nitrophenol	UG/KG	0			0	35						
Acenaphthene	UG/KG	0	500,000	0	0	35						
Acenaphthylene	UG/KG	30	500,000	0	3	35						
Anthracene	UG/KG	18	500,000	0	2	35						
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35						
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35						
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35						
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35						
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Sample ID							S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/17/2010	3/15/2010	3/15/2010	3/15/2010	4/1/2010	4/1/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35						
Bis(2-Chloroethyl)ether	UG/KG	0			0	35						
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19						
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35						
Butylbenzylphthalate	UG/KG	0			0	35						
Carbazole	UG/KG	0			0	35						
Chrysene	UG/KG	130	56,000	0	12	35						
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35						
Dibenzofuran	UG/KG	0	350,000	0	0	35						
Diethyl phthalate	UG/KG	35			1	35						
Dimethylphthalate	UG/KG	0			0	35						
Di-n-butylphthalate	UG/KG	6,800			12	35						
Di-n-octylphthalate	UG/KG	0			0	35						
Fluoranthene	UG/KG	68	500,000	0	11	35						
Fluorene	UG/KG	0	500,000	0	0	35						
Hexachlorobenzene	UG/KG	110	6,000	0	11	35						
Hexachlorobutadiene	UG/KG	0			0	35						
Hexachlorocyclopentadiene	UG/KG	0			0	35						
Hexachloroethane	UG/KG	1,100			6	35						
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35						
Isophorone	UG/KG	0			0	35						
Naphthalene	UG/KG	30	500,000	0	5	35						
Nitrobenzene	UG/KG	0			0	35						
N-Nitrosodiphenylamine	UG/KG	320			2	35						
N-Nitrosodipropylamine	UG/KG	1,600			5	35						
Pentachlorophenol	UG/KG	0	6,700	0	0	35						
Phenanthrene	UG/KG	46	500,000	0	9	35						
Phenol	UG/KG	0	500,000	0	0	35						
Pyrene	UG/KG	110	500,000	0	12	35						
Herbicides												
2,4,5-T	UG/KG	0			0	35						
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35						
2,4-D	UG/KG	0			0	35						
2,4-DB	UG/KG	0			0	35						
Dalapon	UG/KG	0			0	35						
Dicamba	UG/KG	0			0	35						
Dichloroprop	UG/KG	0			0	35						
Dinoseb	UG/KG	0			0	35						
MCPA	UG/KG	9,400			2	35						
MCPP	UG/KG	0			0	35						
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47						
1,3-Dinitrobenzene	UG/KG	0			0	47						
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47						
2,4-Dinitrotoluene	UG/KG	1,100			36	47						
2,6-Dinitrotoluene	UG/KG	0			0	47						
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47						
2-Nitrotoluene	UG/KG	0			0	31						
3,5-Dinitroaniline	UG/KG	0			0	31						
3-Nitrotoluene	UG/KG	0			0	31						
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47						
4-Nitrotoluene	UG/KG	0			0	31						
HMX	UG/KG	470			32	47						
Nitrobenzene	UG/KG	0			0	31						
Nitroglycerine	UG/KG	1,500			1	31						
Pentaerythritol Tetranitrate	UG/KG	0			0	31						
RDX	UG/KG	5,800			39	47						
Tetryl	UG/KG	330			4	47						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Sample ID							S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/17/2010	3/15/2010	3/15/2010	3/15/2010	4/1/2010	4/1/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34						
Aroclor-1221	UG/KG	0	1,000	0	0	34						
Aroclor-1232	UG/KG	0	1,000	0	0	34						
Aroclor-1242	UG/KG	0	1,000	0	0	34						
Aroclor-1248	UG/KG	0	1,000	0	0	34						
Aroclor-1254	UG/KG	2,000	1,000	1	2	34						
Aroclor-1260	UG/KG	0	1,000	0	0	34						
4,4'-DDD	UG/KG	2.4	92,000	0	2	34						
4,4'-DDE	UG/KG	4.2	62,000	0	22	35						
4,4'-DDT	UG/KG	3.4	47,000	0	17	34						
Aldrin	UG/KG	0	680	0	0	34						
Alpha-BHC	UG/KG	0	3,400	0	0	34						
Alpha-Chlordane	UG/KG	2	24,000	0	4	34						
Beta-BHC	UG/KG	0	3,000	0	0	34						
Delta-BHC	UG/KG	0	500,000	0	0	34						
Dieldrin	UG/KG	3.2	1,400	0	14	34						
Endosulfan I	UG/KG	55	200,000	0	21	35						
Endosulfan II	UG/KG	0.88	200,000	0	1	34						
Endosulfan sulfate	UG/KG	0	200,000	0	0	34						
Endrin	UG/KG	3.6	89,000	0	1	34						
Endrin aldehyde	UG/KG	0			0	34						
Endrin ketone	UG/KG	0.58			1	34						
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34						
Gamma-Chlordane	UG/KG	1.1			3	34						
Heptachlor	UG/KG	0	15,000	0	0	34						
Heptachlor epoxide	UG/KG	0			0	34						
Methoxychlor	UG/KG	45			1	34						
Toxaphene	UG/KG	0			0	34						
Inorganics												
Aluminum	MG/KG	27,900			97	97	14,200 J	18,700	17,000	20,700	17,800	17,700
Antimony	MG/KG	5.1			32	97	0.41 UJ	0.1 UJ	0.09 UJ	0.12 UJ	0.26 J	0.62 J
Arsenic	MG/KG	12.6	16	0	97	97	4.9 J	4.8	3.9	5.1	6.3	5.4
Barium	MG/KG	365	400	0	97	97	55.4 J	108 J	107 J	135 J	144	164
Beryllium	MG/KG	1.2	590	0	95	97	0.65 J	0.85 J	0.77 J	1 J	0.77	0.86
Cadmium	MG/KG	1,100	9.3	11	77	95	4.1 UJ	0.98 U	0.94 U	1.2 U	4.2	9.1
Calcium	MG/KG	193,000			96	97	9,010 J	2,150 J	3,560 J	2,340 J	28,100	20,800
Chromium	MG/KG	446	1,500	0	97	97	26.6 J	24.2 J	23.3 J	27.5 J	27.2	27.7
Cobalt	MG/KG	26.8			97	97	12.1 J	10.1 J	9.1 J	12.9 J	12	11.8
Copper	MG/KG	7,310	270	52	97	97	43.1 J	20 J	23.4 J	23.3 J	192	**462**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	26,000 J	22,500 J	20,400 J	24,000 J	24,400	27,600
Lead	MG/KG	998	1,000	0	97	97	53.2 J	20.6	22.8	27.9	50	72.3
Magnesium	MG/KG	15,000			97	97	6,180 J	3,770 J	3,800 J	4,210 J	7,290	6,560
Manganese	MG/KG	5,040	10,000	0	97	97	328 J	735 J	466 J	1,080 J	581	618
Nickel	MG/KG	59.3	310	0	92	92	52.1 J	24.8 J	29.4 J	32.7 J	39.9	39.8
Potassium	MG/KG	4,880			76	76	2,140 J	2,740 J	2,780 J	3,410 J	2,540	2,920
Selenium	MG/KG	0.92	1,500	0	4	97	0.9 UJ	0.21 U	0.21 U	0.26 U	0.59 U	0.72 U
Silver	MG/KG	205	1,500	0	66	97	0.27 UJ	0.06 U	0.06 U	0.08 U	1.4 J	3.6
Sodium	MG/KG	213			81	97	82 UJ	98 U	94 U	120 U	99.2	92 U
Thallium	MG/KG	0.27			6	97	0.38 UJ	0.09 U	0.09 U	0.11 U	0.25 U	0.3 U
Vanadium	MG/KG	41.9			97	97	22.5 J	31.3 J	27.1 J	33.8 J	29.7	30.9
Zinc	MG/KG	1,470	10,000	0	92	92	114 J	76 J	80 J	114 J	382	321
Mercury	MG/KG	9.1	2.8	49	96	97	0.1 J	0.06	0.09	0.1	1.2	**3**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Sample ID							S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35						
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35						
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35						
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35						
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35						
2,4,6-Trichlorophenol	UG/KG	0			0	35						
2,4-Dichlorophenol	UG/KG	0			0	35						
2,4-Dimethylphenol	UG/KG	0			0	35						
2,4-Dinitrophenol	UG/KG	0			0	35						
2,4-Dinitrotoluene	UG/KG	14,000			13	35						
2,6-Dinitrotoluene	UG/KG	700			2	35						
2-Chloronaphthalene	UG/KG	0			0	35						
2-Chlorophenol	UG/KG	0			0	35						
2-Methylnaphthalene	UG/KG	0			0	35						
2-Methylphenol	UG/KG	0	500,000	0	0	35						
2-Nitroaniline	UG/KG	0			0	35						
2-Nitrophenol	UG/KG	0			0	35						
3 or 4-Methylphenol	UG/KG	0			0	19						
3,3'-Dichlorobenzidine	UG/KG	0			0	35						
3-Nitroaniline	UG/KG	0			0	35						
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35						
4-Bromophenyl phenyl ether	UG/KG	0			0	35						
4-Chloro-3-methylphenol	UG/KG	0			0	35						
4-Chloroaniline	UG/KG	0			0	35						
4-Chlorophenyl phenyl ether	UG/KG	0			0	35						
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35						
4-Nitrophenol	UG/KG	0			0	35						
Acenaphthene	UG/KG	0	500,000	0	0	35						
Acenaphthylene	UG/KG	30	500,000	0	3	35						
Anthracene	UG/KG	18	500,000	0	2	35						
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35						
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35						
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35						
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35						
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Sample ID							S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35						
Bis(2-Chloroethyl)ether	UG/KG	0			0	35						
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19						
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35						
Butylbenzylphthalate	UG/KG	0			0	35						
Carbazole	UG/KG	0			0	35						
Chrysene	UG/KG	130	56,000	0	12	35						
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35						
Dibenzofuran	UG/KG	0	350,000	0	0	35						
Diethyl phthalate	UG/KG	35			1	35						
Dimethylphthalate	UG/KG	0			0	35						
Di-n-butylphthalate	UG/KG	6,800			12	35						
Di-n-octylphthalate	UG/KG	0			0	35						
Fluoranthene	UG/KG	68	500,000	0	11	35						
Fluorene	UG/KG	0	500,000	0	0	35						
Hexachlorobenzene	UG/KG	110	6,000	0	11	35						
Hexachlorobutadiene	UG/KG	0			0	35						
Hexachlorocyclopentadiene	UG/KG	0			0	35						
Hexachloroethane	UG/KG	1,100			6	35						
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35						
Isophorone	UG/KG	0			0	35						
Naphthalene	UG/KG	30	500,000	0	5	35						
Nitrobenzene	UG/KG	0			0	35						
N-Nitrosodiphenylamine	UG/KG	320			2	35						
N-Nitrosodipropylamine	UG/KG	1,600			5	35						
Pentachlorophenol	UG/KG	0	6,700	0	0	35						
Phenanthrene	UG/KG	46	500,000	0	9	35						
Phenol	UG/KG	0	500,000	0	0	35						
Pyrene	UG/KG	110	500,000	0	12	35						
Herbicides												
2,4,5-T	UG/KG	0			0	35						
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35						
2,4-D	UG/KG	0			0	35						
2,4-DB	UG/KG	0			0	35						
Dalapon	UG/KG	0			0	35						
Dicamba	UG/KG	0			0	35						
Dichloroprop	UG/KG	0			0	35						
Dinoseb	UG/KG	0			0	35						
MCPA	UG/KG	9,400			2	35						
MCPP	UG/KG	0			0	35						
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47						
1,3-Dinitrobenzene	UG/KG	0			0	47						
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47						
2,4-Dinitrotoluene	UG/KG	1,100			36	47						
2,6-Dinitrotoluene	UG/KG	0			0	47						
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47						
2-Nitrotoluene	UG/KG	0			0	31						
3,5-Dinitroaniline	UG/KG	0			0	31						
3-Nitrotoluene	UG/KG	0			0	31						
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47						
4-Nitrotoluene	UG/KG	0			0	31						
HMX	UG/KG	470			32	47						
Nitrobenzene	UG/KG	0			0	31						
Nitroglycerine	UG/KG	1,500			1	31						
Pentaerythritol Tetranitrate	UG/KG	0			0	31						
RDX	UG/KG	5,800			39	47						
Tetryl	UG/KG	330			4	47						

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Sample ID							S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34						
Aroclor-1221	UG/KG	0	1,000	0	0	34						
Aroclor-1232	UG/KG	0	1,000	0	0	34						
Aroclor-1242	UG/KG	0	1,000	0	0	34						
Aroclor-1248	UG/KG	0	1,000	0	0	34						
Aroclor-1254	UG/KG	2,000	1,000	1	2	34						
Aroclor-1260	UG/KG	0	1,000	0	0	34						
4,4'-DDD	UG/KG	2.4	92,000	0	2	34						
4,4'-DDE	UG/KG	4.2	62,000	0	22	35						
4,4'-DDT	UG/KG	3.4	47,000	0	17	34						
Aldrin	UG/KG	0	680	0	0	34						
Alpha-BHC	UG/KG	0	3,400	0	0	34						
Alpha-Chlordane	UG/KG	2	24,000	0	4	34						
Beta-BHC	UG/KG	0	3,000	0	0	34						
Delta-BHC	UG/KG	0	500,000	0	0	34						
Dieldrin	UG/KG	3.2	1,400	0	14	34						
Endosulfan I	UG/KG	55	200,000	0	21	35						
Endosulfan II	UG/KG	0.88	200,000	0	1	34						
Endosulfan sulfate	UG/KG	0	200,000	0	0	34						
Endrin	UG/KG	3.6	89,000	0	1	34						
Endrin aldehyde	UG/KG	0			0	34						
Endrin ketone	UG/KG	0.58			1	34						
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34						
Gamma-Chlordane	UG/KG	1.1			3	34						
Heptachlor	UG/KG	0	15,000	0	0	34						
Heptachlor epoxide	UG/KG	0			0	34						
Methoxychlor	UG/KG	45			1	34						
Toxaphene	UG/KG	0			0	34						
Inorganics												
Aluminum	MG/KG	27,900			97	97	19,000	17,900	20,800	16,800	24,600	18,500
Antimony	MG/KG	5.1			32	97	0.98 J	0.32 J	0.24 J	0.87 J	0.68 J	0.13 U
Arsenic	MG/KG	12.6	16	0	97	97	5.1	5.2	5.7	5.2	5.1	4.2
Barium	MG/KG	365	400	0	97	97	166	150	140	194	205	122
Beryllium	MG/KG	1.2	590	0	95	97	0.83	0.78	0.78	0.72	1	0.78
Cadmium	MG/KG	1,100	9.3	11	77	95	6.6	6.4	6	8.3	8.2	1.1 U
Calcium	MG/KG	193,000			96	97	16,900	22,300	32,600	36,400	18,400	8,950
Chromium	MG/KG	446	1,500	0	97	97	28.6	29.3	27.9	27.4	35.4	24.7
Cobalt	MG/KG	26.8			97	97	12.3	11.7	12	10.8	12.6	9.8
Copper	MG/KG	7,310	270	52	97	97	217	**364**	**284**	233	**429**	41.3
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	26,600	26,500	25,300	25,400	29,100	22,900
Lead	MG/KG	998	1,000	0	97	97	51	52.9	48.9	70.3	69.4	28.2
Magnesium	MG/KG	15,000			97	97	6,530	7,100	7,260	9,130	7,340	4,720
Manganese	MG/KG	5,040	10,000	0	97	97	676	518	651	530	470	549
Nickel	MG/KG	59.3	310	0	92	92	40.1	41.4	37.4	38.3	46.6	28.9
Potassium	MG/KG	4,880			76	76	3,240	2,920	2,980	2,550	4,020	2,260
Selenium	MG/KG	0.92	1,500	0	4	97	0.81 U	0.69 U	1.7 U	0.76 U	0.9 U	0.45 U
Silver	MG/KG	205	1,500	0	66	97	2.5 J	3	0.82 J	1.9 J	3 J	0.29 J
Sodium	MG/KG	213			81	97	77 J	90.2	92.2	120	93.7 J	66.2 J
Thallium	MG/KG	0.27			6	97	0.34 U	0.29 U	0.28 U	0.32 U	0.38 U	0.19 U
Vanadium	MG/KG	41.9			97	97	31.7	28.6	30.2	27	38.9	30.8
Zinc	MG/KG	1,470	10,000	0	92	92	274	324	392	588	421	91.2
Mercury	MG/KG	9.1	2.8	49	96	97	**3.1**	**5.3**	1.7	**6.4**	**4.2**	2.2

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Sample ID							S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/16/2010	3/16/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35					100 U	
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35					110 U	
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35					98 U	
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35					110 U	
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35					200 U	
2,4,6-Trichlorophenol	UG/KG	0			0	35					200 UJ	
2,4-Dichlorophenol	UG/KG	0			0	35					190 UJ	
2,4-Dimethylphenol	UG/KG	0			0	35					210 UJ	
2,4-Dinitrophenol	UG/KG	0			0	35					470 UJ	
2,4-Dinitrotoluene	UG/KG	14,000			13	35					110 U	
2,6-Dinitrotoluene	UG/KG	700			2	35					99 U	
2-Chloronaphthalene	UG/KG	0			0	35					110 UJ	
2-Chlorophenol	UG/KG	0			0	35					210 UJ	
2-Methylnaphthalene	UG/KG	0			0	35					120 U	
2-Methylphenol	UG/KG	0	500,000	0	0	35					250 UJ	
2-Nitroaniline	UG/KG	0			0	35					94 U	
2-Nitrophenol	UG/KG	0			0	35					210 UJ	
3 or 4-Methylphenol	UG/KG	0			0	19					240 UJ	
3,3'-Dichlorobenzidine	UG/KG	0			0	35					140 UJ	
3-Nitroaniline	UG/KG	0			0	35					120 UJ	
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35					420 U	
4-Bromophenyl phenyl ether	UG/KG	0			0	35					110 U	
4-Chloro-3-methylphenol	UG/KG	0			0	35					210 U	
4-Chloroaniline	UG/KG	0			0	35					150 UJ	
4-Chlorophenyl phenyl ether	UG/KG	0			0	35					98 U	
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35					170 UJ	
4-Nitrophenol	UG/KG	0			0	35					390 U	
Acenaphthene	UG/KG	0	500,000	0	0	35					82 U	
Acenaphthylene	UG/KG	30	500,000	0	3	35					88 U	
Anthracene	UG/KG	18	500,000	0	2	35					100 U	
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35					110 U	
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35					120 U	
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35					170 U	
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35					130 U	
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35					100 U	

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Sample ID							S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/16/2010	3/16/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35					120 UJ	
Bis(2-Chloroethyl)ether	UG/KG	0			0	35					100 U	
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19					110 U	
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35					120 U	
Butylbenzylphthalate	UG/KG	0			0	35					120 U	
Carbazole	UG/KG	0			0	35					140 U	
Chrysene	UG/KG	130	56,000	0	12	35					120 U	
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35					160 U	
Dibenzofuran	UG/KG	0	350,000	0	0	35					99 U	
Diethyl phthalate	UG/KG	35			1	35					100 U	
Dimethylphthalate	UG/KG	0			0	35					98 U	
Di-n-butylphthalate	UG/KG	6,800			12	35					130 U	
Di-n-octylphthalate	UG/KG	0			0	35					260 U	
Fluoranthene	UG/KG	68	500,000	0	11	35					130 U	
Fluorene	UG/KG	0	500,000	0	0	35					100 U	
Hexachlorobenzene	UG/KG	110	6,000	0	11	35					100 U	
Hexachlorobutadiene	UG/KG	0			0	35					100 U	
Hexachlorocyclopentadiene	UG/KG	0			0	35					100 UJ	
Hexachloroethane	UG/KG	1,100			6	35					120 U	
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35					150 U	
Isophorone	UG/KG	0			0	35					94 U	
Naphthalene	UG/KG	30	500,000	0	5	35					110 U	
Nitrobenzene	UG/KG	0			0	35					110 U	
N-Nitrosodiphenylamine	UG/KG	320			2	35					280 UJ	
N-Nitrosodipropylamine	UG/KG	1,600			5	35					100 U	
Pentachlorophenol	UG/KG	0	6,700	0	0	35					300 UJ	
Phenanthrene	UG/KG	46	500,000	0	9	35					100 U	
Phenol	UG/KG	0	500,000	0	0	35					200 U	
Pyrene	UG/KG	110	500,000	0	12	35					130 U	
Herbicides												
2,4,5-T	UG/KG	0			0	35					20 U	
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35					16 U	
2,4-D	UG/KG	0			0	35					40 U	
2,4-DB	UG/KG	0			0	35					29 U	
Dalapon	UG/KG	0			0	35					10 U	
Dicamba	UG/KG	0			0	35					14 U	
Dichloroprop	UG/KG	0			0	35					23 U	
Dinoseb	UG/KG	0			0	35					3.2 UJ	
MCPA	UG/KG	9,400			2	35					2,900 U	
MCPP	UG/KG	0			0	35					2,800 U	
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47					8.5 U	
1,3-Dinitrobenzene	UG/KG	0			0	47					7.9 U	
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47					8.5 U	
2,4-Dinitrotoluene	UG/KG	1,100			36	47					19 U	
2,6-Dinitrotoluene	UG/KG	0			0	47					34 U	
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47					27 U	
2-Nitrotoluene	UG/KG	0			0	31					15 U	
3,5-Dinitroaniline	UG/KG	0			0	31					4.5 U	
3-Nitrotoluene	UG/KG	0			0	31					10 UJ	
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47					22 U	
4-Nitrotoluene	UG/KG	0			0	31					34 U	
HMX	UG/KG	470			32	47					11 U	
Nitrobenzene	UG/KG	0			0	31					28 U	
Nitroglycerine	UG/KG	1,500			1	31					160 U	
Pentaerythritol Tetranitrate	UG/KG	0			0	31					300 U	
RDX	UG/KG	5,800			39	47					8.6 U	
Tetryl	UG/KG	330			4	47					6.9 UJ	

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Sample ID							S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/16/2010	3/16/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34					7.4 U	
Aroclor-1221	UG/KG	0	1,000	0	0	34					17 U	
Aroclor-1232	UG/KG	0	1,000	0	0	34					11 U	
Aroclor-1242	UG/KG	0	1,000	0	0	34					7.1 U	
Aroclor-1248	UG/KG	0	1,000	0	0	34					7.5 U	
Aroclor-1254	UG/KG	2,000	1,000	1	2	34					5.8 U	
Aroclor-1260	UG/KG	0	1,000	0	0	34					7.4 U	
4,4'-DDD	UG/KG	2.4	92,000	0	2	34					0.24 U	
4,4'-DDE	UG/KG	4.2	62,000	0	22	35					1.6 J	
4,4'-DDT	UG/KG	3.4	47,000	0	17	34					0.38 U	
Aldrin	UG/KG	0	680	0	0	34					0.34 U	
Alpha-BHC	UG/KG	0	3,400	0	0	34					0.42 U	
Alpha-Chlordane	UG/KG	2	24,000	0	4	34					0.26 U	
Beta-BHC	UG/KG	0	3,000	0	0	34					0.4 U	
Delta-BHC	UG/KG	0	500,000	0	0	34					0.39 U	
Dieldrin	UG/KG	3.2	1,400	0	14	34					0.96 J	
Endosulfan I	UG/KG	55	200,000	0	21	35					23 J	
Endosulfan II	UG/KG	0.88	200,000	0	1	34					0.42 UJ	
Endosulfan sulfate	UG/KG	0	200,000	0	0	34					0.71 U	
Endrin	UG/KG	3.6	89,000	0	1	34					1 U	
Endrin aldehyde	UG/KG	0			0	34					0.6 UJ	
Endrin ketone	UG/KG	0.58			1	34					0.49 U	
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34					0.33 U	
Gamma-Chlordane	UG/KG	1.1			3	34					0.28 U	
Heptachlor	UG/KG	0	15,000	0	0	34					0.36 U	
Heptachlor epoxide	UG/KG	0			0	34					0.27 U	
Methoxychlor	UG/KG	45			1	34					0.61 U	
Toxaphene	UG/KG	0			0	34					8.6 U	
Inorganics												
Aluminum	MG/KG	27,900			97	97	19,000	21,300	19,400	5,910	17,200	16,700
Antimony	MG/KG	5.1			32	97	0.18 U	0.42 J	0.11 U	2.2	0.14 J	3.1
Arsenic	MG/KG	12.6	16	0	97	97	5.7	5	4.6	4	5	5.1
Barium	MG/KG	365	400	0	97	97	140	299	89.7	27.9	152 J	257 J
Beryllium	MG/KG	1.2	590	0	95	97	0.88	0.81	0.69	0.43 U	0.74 J	0.71 J
Cadmium	MG/KG	1,100	9.3	11	77	95	1.6 U	4.1	1 U	0.86 U	6	3.3
Calcium	MG/KG	193,000			96	97	13,200	40,500	2,900	193,000	31,200 J	17,100 J
Chromium	MG/KG	446	1,500	0	97	97	28.4	29.7	25.1	10.6	26.1 J	25.6 J
Cobalt	MG/KG	26.8			97	97	10.9	11.4	9.4	9.5	11.1 J	10 J
Copper	MG/KG	7,310	270	52	97	97	82.6	263	39.1	38.9	221	**289**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	24,000	26,500	23,100	7,600	26,000 J	24,300 J
Lead	MG/KG	998	1,000	0	97	97	22.5	28.3	21	29.7	86.2	352
Magnesium	MG/KG	15,000			97	97	6,750	7,880	4,460	15,000	7,210 J	6,870 J
Manganese	MG/KG	5,040	10,000	0	97	97	428	606	361	363	583 J	438 J
Nickel	MG/KG	59.3	310	0	92	92	37	42.5	26.2	23.8	38.1 J	32.5 J
Potassium	MG/KG	4,880			76	76	2,970	2,880	2,610	2,620	2,780 J	2,470 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.63 U	0.82 U	0.4 U	0.34 U	0.23 U	0.23 U
Silver	MG/KG	205	1,500	0	66	97	0.42 J	0.47 J	0.23 J	0.04 U	1.6 U	1.6 U
Sodium	MG/KG	213			81	97	81 U	112	59.1 J	179	135	110
Thallium	MG/KG	0.27			6	97	0.27 U	0.35 U	0.17 U	0.14 U	0.1 U	0.1 U
Vanadium	MG/KG	41.9			97	97	33.6	29.5	32.2	16.6	26.7 J	27.5 J
Zinc	MG/KG	1,470	10,000	0	92	92	160	938	99.2	66.8	284 J	335 J
Mercury	MG/KG	9.1	2.8	49	96	97	1.4	0.9	0.48	0.15	**3.7**	1.6

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R5-03	S45-R5-04	S45-R5-04	S45-R5-05	S45-R5-06	S45-R5-07
Sample ID							S45-R5-03	S45-R5-04	S45-R5-04D	S45-R5-05	S45-R5-06	S45-R5-07
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010
QC Type							SA	SA	DU	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35	100 U	98 U	100 U	97 U		
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35	110 U	110 U	110 U	100 U		
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35	100 U	94 U	97 U	93 U		
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35	110 U	100 U	110 U	100 U		
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35	200 U	190 U	190 U	180 U		
2,4,6-Trichlorophenol	UG/KG	0			0	35	200 UJ	190 UJ	190 UJ	180 UJ		
2,4-Dichlorophenol	UG/KG	0			0	35	190 UJ	180 UJ	190 UJ	180 UJ		
2,4-Dimethylphenol	UG/KG	0			0	35	210 UJ	200 UJ	200 UJ	200 UJ		
2,4-Dinitrophenol	UG/KG	0			0	35	490 UJ	450 UJ	470 UJ	450 UJ		
2,4-Dinitrotoluene	UG/KG	14,000			13	35	110 U	100 U	110 U	100 U		
2,6-Dinitrotoluene	UG/KG	700			2	35	100 U	95 U	99 U	95 U		
2-Chloronaphthalene	UG/KG	0			0	35	110 UJ	100 UJ	110 UJ	100 UJ		
2-Chlorophenol	UG/KG	0			0	35	210 UJ	200 UJ	200 UJ	200 UJ		
2-Methylnaphthalene	UG/KG	0			0	35	120 U	110 U	110 U	110 U		
2-Methylphenol	UG/KG	0	500,000	0	0	35	260 UJ	240 UJ	250 UJ	240 UJ		
2-Nitroaniline	UG/KG	0			0	35	97 U	90 U	94 U	90 U		
2-Nitrophenol	UG/KG	0			0	35	220 UJ	200 UJ	210 UJ	200 UJ		
3 or 4-Methylphenol	UG/KG	0			0	19	240 UJ	220 UJ	230 UJ	220 UJ		
3,3'-Dichlorobenzidine	UG/KG	0			0	35	150 UJ	140 UJ	140 UJ	140 UJ		
3-Nitroaniline	UG/KG	0			0	35	120 UJ	110 UJ	120 UJ	110 UJ		
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35	440 U	410 U	420 U	400 U		
4-Bromophenyl phenyl ether	UG/KG	0			0	35	110 U	100 U	110 U	100 U		
4-Chloro-3-methylphenol	UG/KG	0			0	35	220 U	200 U	210 U	200 U		
4-Chloroaniline	UG/KG	0			0	35	150 UJ	140 UJ	150 UJ	140 UJ		
4-Chlorophenyl phenyl ether	UG/KG	0			0	35	100 U	94 U	97 U	93 U		
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35	170 UJ	160 UJ	170 UJ	160 UJ		
4-Nitrophenol	UG/KG	0			0	35	400 U	370 U	380 U	370 U		
Acenaphthene	UG/KG	0	500,000	0	0	35	84 U	78 U	81 U	78 U		
Acenaphthylene	UG/KG	30	500,000	0	3	35	91 U	84 U	87 U	84 U		
Anthracene	UG/KG	18	500,000	0	2	35	110 U	100 U	100 U	100 U		
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35	110 U	100 U	110 U	100 U		
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35	120 U	110 U	120 U	110 U		
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35	170 U	160 U	170 U	160 U		
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35	130 U	120 U	130 U	120 U		
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35	110 U	100 U	100 U	99 U		

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R5-03	S45-R5-04	S45-R5-04	S45-R5-05	S45-R5-06	S45-R5-07
Sample ID							S45-R5-03	S45-R5-04	S45-R5-04D	S45-R5-05	S45-R5-06	S45-R5-07
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010
QC Type							SA	SA	DU	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35	120 UJ	120 UJ	120 UJ	120 UJ		
Bis(2-Chloroethyl)ether	UG/KG	0			0	35	100 U	98 U	100 U	97 U		
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19	120 U	110 U	110 U	110 U		
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35	130 U	120 U	120 U	120 U		
Butylbenzylphthalate	UG/KG	0			0	35	120 U	110 U	120 U	110 U		
Carbazole	UG/KG	0			0	35	140 U	130 U	140 U	130 U		
Chrysene	UG/KG	130	56,000	0	12	35	120 U	110 U	120 U	110 U		
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35	170 U	150 U	160 U	150 U		
Dibenzofuran	UG/KG	0	350,000	0	0	35	100 U	95 U	99 U	95 U		
Diethyl phthalate	UG/KG	35			1	35	100 U	96 U	100 U	96 U		
Dimethylphthalate	UG/KG	0			0	35	100 U	94 U	97 U	93 U		
Di-n-butylphthalate	UG/KG	6,800			12	35	130 U	120 U	130 U	120 U		
Di-n-octylphthalate	UG/KG	0			0	35	270 U	250 U	260 U	250 U		
Fluoranthene	UG/KG	68	500,000	0	11	35	140 U	130 U	130 U	130 U		
Fluorene	UG/KG	0	500,000	0	0	35	100 U	98 U	100 U	97 U		
Hexachlorobenzene	UG/KG	110	6,000	0	11	35	110 U	99 U	100 U	98 U		
Hexachlorobutadiene	UG/KG	0			0	35	110 U	100 U	100 U	99 U		
Hexachlorocyclopentadiene	UG/KG	0			0	35	110 UJ	99 UJ	100 UJ	98 UJ		
Hexachloroethane	UG/KG	1,100			6	35	120 U	120 U	120 U	120 U		
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35	160 U	150 U	150 U	150 U		
Isophorone	UG/KG	0			0	35	97 U	90 U	94 U	90 U		
Naphthalene	UG/KG	30	500,000	0	5	35	110 U	100 U	110 U	100 U		
Nitrobenzene	UG/KG	0			0	35	120 U	110 U	110 U	110 U		
N-Nitrosodiphenylamine	UG/KG	320			2	35	280 UJ	260 UJ	270 UJ	260 UJ		
N-Nitrosodipropylamine	UG/KG	1,600			5	35	110 U	100 U	100 U	99 U		
Pentachlorophenol	UG/KG	0	6,700	0	0	35	310 UJ	280 UJ	300 UJ	280 UJ		
Phenanthrene	UG/KG	46	500,000	0	9	35	110 U	100 U	100 U	99 U		
Phenol	UG/KG	0	500,000	0	0	35	200 U	190 U	190 U	190 U		
Pyrene	UG/KG	110	500,000	0	12	35	130 U	120 U	130 U	120 U		
Herbicides												
2,4,5-T	UG/KG	0			0	35	21 U	20 U	19 U	18 U		
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35	17 U	16 U	15 U	14 U		
2,4-D	UG/KG	0			0	35	43 U	41 U	38 U	37 U		
2,4-DB	UG/KG	0			0	35	31 U	30 U	28 U	27 U		
Dalapon	UG/KG	0			0	35	11 U	10 U	9.8 U	9.5 U		
Dicamba	UG/KG	0			0	35	15 U	14 U	13 U	13 U		
Dichloroprop	UG/KG	0			0	35	25 U	24 U	22 U	22 U		
Dinoseb	UG/KG	0			0	35	3.4 UJ	3.3 UJ	3 UJ	3 UJ		
MCPA	UG/KG	9,400			2	35	3,100 U	3,000 U	2,800 U	2,700 U		
MCPP	UG/KG	0			0	35	2,900 U	2,800 U	2,600 U	2,500 U		
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47	8 U	7.4 U	7.5 U	7.3 U		
1,3-Dinitrobenzene	UG/KG	0			0	47	7.4 U	6.8 U	6.9 U	6.7 U		
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	8 U	7.4 U	7.5 U	470		
2,4-Dinitrotoluene	UG/KG	1,100			36	47	18 U	16 U	17 U	840		
2,6-Dinitrotoluene	UG/KG	0			0	47	32 U	30 U	30 U	29 U		
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	25 U	23 U	23 U	23 U		
2-Nitrotoluene	UG/KG	0			0	31	14 U	13 U	13 U	13 U		
3,5-Dinitroaniline	UG/KG	0			0	31	4.2 U	3.9 U	3.9 U	3.8 U		
3-Nitrotoluene	UG/KG	0			0	31	9.5 UJ	8.7 UJ	8.8 UJ	8.6 UJ		
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	20 U	19 U	19 U	18 U		
4-Nitrotoluene	UG/KG	0			0	31	32 U	30 U	30 U	29 U		
HMX	UG/KG	470			32	47	10 U	9.5 U	9.6 U	9.3 U		
Nitrobenzene	UG/KG	0			0	31	26 U	24 U	24 U	24 U		
Nitroglycerine	UG/KG	1,500			1	31	150 U	140 U	140 U	130 U		
Pentaerythritol Tetranitrate	UG/KG	0			0	31	290 U	260 U	270 U	260 U		
RDX	UG/KG	5,800			39	47	8.2 U	7.5 U	7.6 U	7.4 U		
Tetryl	UG/KG	330			4	47	6.5 UJ	6 UJ	6 UJ	5.9 UJ		

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R5-03	S45-R5-04	S45-R5-04	S45-R5-05	S45-R5-06	S45-R5-07
Sample ID							S45-R5-03	S45-R5-04	S45-R5-04D	S45-R5-05	S45-R5-06	S45-R5-07
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010
QC Type							SA	SA	DU	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34	8.3 U	7.1 U	7.7 U	7.2 U		
Aroclor-1221	UG/KG	0	1,000	0	0	34	19 U	17 U	18 U	17 U		
Aroclor-1232	UG/KG	0	1,000	0	0	34	13 U	11 U	12 U	11 U		
Aroclor-1242	UG/KG	0	1,000	0	0	34	8 U	6.9 U	7.4 U	6.9 U		
Aroclor-1248	UG/KG	0	1,000	0	0	34	8.4 U	7.3 U	7.8 U	7.3 U		
Aroclor-1254	UG/KG	2,000	1,000	1	2	34	6.5 U	5.6 U	6 U	5.6 U		
Aroclor-1260	UG/KG	0	1,000	0	0	34	8.3 U	7.1 U	7.7 U	7.2 U		
4,4'-DDD	UG/KG	2.4	92,000	0	2	34	0.28 U	0.24 U	0.26 U	0.24 U		
4,4'-DDE	UG/KG	4.2	62,000	0	22	35	1.7 J	0.23 U	0.24 U	0.85 J		
4,4'-DDT	UG/KG	3.4	47,000	0	17	34	1.2 J	0.37 U	0.4 U	0.37 U		
Aldrin	UG/KG	0	680	0	0	34	0.38 U	0.33 U	0.36 U	0.34 U		
Alpha-BHC	UG/KG	0	3,400	0	0	34	0.47 U	0.4 U	0.44 U	0.41 U		
Alpha-Chlordane	UG/KG	2	24,000	0	4	34	0.29 U	0.25 U	0.27 U	0.25 U		
Beta-BHC	UG/KG	0	3,000	0	0	34	0.45 U	0.39 U	0.42 U	0.4 U		
Delta-BHC	UG/KG	0	500,000	0	0	34	0.44 U	0.38 U	0.41 U	0.38 U		
Dieldrin	UG/KG	3.2	1,400	0	14	34	1.1 J	0.26 U	0.28 U	0.79 J		
Endosulfan I	UG/KG	55	200,000	0	21	35	1.3 JN	0.28 UJ	55 J	0.29 UJ		
Endosulfan II	UG/KG	0.88	200,000	0	1	34	0.47 UJ	0.4 UJ	0.44 UJ	0.41 UJ		
Endosulfan sulfate	UG/KG	0	200,000	0	0	34	0.8 U	0.69 U	0.74 U	0.69 U		
Endrin	UG/KG	3.6	89,000	0	1	34	1.2 U	1 U	1.1 U	1 U		
Endrin aldehyde	UG/KG	0			0	34	0.68 UJ	0.58 UJ	0.63 UJ	0.59 UJ		
Endrin ketone	UG/KG	0.58			1	34	0.55 U	0.48 U	0.51 U	0.48 U		
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34	0.37 U	0.32 U	0.35 U	0.32 U		
Gamma-Chlordane	UG/KG	1.1			3	34	0.32 U	0.27 U	0.3 U	0.28 U		
Heptachlor	UG/KG	0	15,000	0	0	34	0.4 U	0.34 U	0.37 U	0.35 U		
Heptachlor epoxide	UG/KG	0			0	34	0.3 U	0.26 U	0.28 U	0.26 U		
Methoxychlor	UG/KG	45			1	34	0.69 U	0.6 U	0.64 U	0.6 U		
Toxaphene	UG/KG	0			0	34	9.6 U	8.3 U	9 U	8.4 U		
Inorganics												
Aluminum	MG/KG	27,900			97	97	18,900	18,100	18,800	18,700	21,600	16,100
Antimony	MG/KG	5.1			32	97	0.15 U	0.09 UJ	0.12 UJ	0.11 U	0.11 U	0.18 J
Arsenic	MG/KG	12.6	16	0	97	97	5.4	5.5	7	5.2	5.2	5.1
Barium	MG/KG	365	400	0	97	97	177 J	106 J	114 J	165 J	148 J	111 J
Beryllium	MG/KG	1.2	590	0	95	97	0.85 J	0.9 J	0.95 J	0.79 J	0.86 J	0.75 J
Cadmium	MG/KG	1,100	9.3	11	77	95	6.4	0.86 U	0.46 J	5.1	0.62 J	8.3
Calcium	MG/KG	193,000			96	97	20,600 J	3,290 J	3,490 J	29,300 J	5,100 J	41,300 J
Chromium	MG/KG	446	1,500	0	97	97	29.7 J	26.4 J	28 J	26.7 J	28.8 J	25.6 J
Cobalt	MG/KG	26.8			97	97	13.4 J	11 J	16.4 J	10 J	9.2 J	11.8 J
Copper	MG/KG	7,310	270	52	97	97	$\boxed{\textbf{350}}$	31.5	33.6	219	44.4	210
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	25,400 J	25,800 J	30,400 J	25,400 J	25,200 J	26,800 J
Lead	MG/KG	998	1,000	0	97	97	60	11.9 J	15.4 J	42.9	12.9	44.6
Magnesium	MG/KG	15,000			97	97	7,260 J	4,980 J	5,330 J	7,140 J	5,740 J	8,440 J
Manganese	MG/KG	5,040	10,000	0	97	97	662 J	336 J	787 J	489 J	395 J	591 J
Nickel	MG/KG	59.3	310	0	92	92	40.1 J	43 J	56 J	33.4 J	29.8 J	38.9 J
Potassium	MG/KG	4,880			76	76	3,060 J	2,670 J	2,960 J	3,220 J	4,140 J	2,640 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.33 U	0.19 U	0.26 U	0.24 U	0.25 U	0.25 U
Silver	MG/KG	205	1,500	0	66	97	2.6	0.06 U	0.08 U	1.7 U	1.7 U	1.7 U
Sodium	MG/KG	213			81	97	103	86 U	70.2 J	127	110 U	132
Thallium	MG/KG	0.27			6	97	0.14 U	0.08 U	0.11 U	0.1 U	0.11 U	0.1 U
Vanadium	MG/KG	41.9			97	97	31.8 J	29.7 J	31.2 J	30.1 J	37.3 J	25 J
Zinc	MG/KG	1,470	10,000	0	92	92	304 J	80.2 J	83.9 J	360 J	89.5 J	230 J
Mercury	MG/KG	9.1	2.8	49	96	97	$\boxed{\textbf{4.7}}$	0.03 J	0.039 U	1.3	0.23	1

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed						
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Sample ID							S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
							Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35		92 U				90 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35		100 U				98 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35		88 U				87 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35		97 U				96 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35		180 U				170 U
2,4,6-Trichlorophenol	UG/KG	0			0	35		180 U				170 U
2,4-Dichlorophenol	UG/KG	0			0	35		170 U				170 U
2,4-Dimethylphenol	UG/KG	0			0	35		190 U				180 U
2,4-Dinitrophenol	UG/KG	0			0	35		430 U				420 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35		380				94 U
2,6-Dinitrotoluene	UG/KG	700			2	35		90 U				88 U
2-Chloronaphthalene	UG/KG	0			0	35		99 U				97 U
2-Chlorophenol	UG/KG	0			0	35		180 U				180 U
2-Methylnaphthalene	UG/KG	0			0	35		100 U				100 U
2-Methylphenol	UG/KG	0	500,000	0	0	35		230 U				220 U
2-Nitroaniline	UG/KG	0			0	35		85 U				83 U
2-Nitrophenol	UG/KG	0			0	35		190 U				180 U
3 or 4-Methylphenol	UG/KG	0			0	19		210 U				210 U
3,3'-Dichlorobenzidine	UG/KG	0			0	35		130 U				130 U
3-Nitroaniline	UG/KG	0			0	35		110 U				100 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35		380 U				370 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35		96 U				94 U
4-Chloro-3-methylphenol	UG/KG	0			0	35		190 U				180 U
4-Chloroaniline	UG/KG	0			0	35		130 U				130 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35		88 U				87 U
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35		150 U				150 U
4-Nitrophenol	UG/KG	0			0	35		350 U				340 U
Acenaphthene	UG/KG	0	500,000	0	0	35		74 U				72 U
Acenaphthylene	UG/KG	30	500,000	0	3	35		79 U				78 U
Anthracene	UG/KG	18	500,000	0	2	35		95 U				93 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35		97 U				96 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35		100 U				100 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35		150 U				150 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35		120 UJ				120 UJ
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35		94 U				92 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Sample ID							S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35		110 U				110 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35		92 U				90 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19		100 U				99 U
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35		110 U				110 U
Butylbenzylphthalate	UG/KG	0			0	35		100 U				100 U
Carbazole	UG/KG	0			0	35		120 U				120 U
Chrysene	UG/KG	130	56,000	0	12	35		110 U				100 U
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35		140 U				140 U
Dibenzofuran	UG/KG	0	350,000	0	0	35		90 U				88 U
Diethyl phthalate	UG/KG	35			1	35		91 U				89 U
Dimethylphthalate	UG/KG	0			0	35		88 U				87 U
Di-n-butylphthalate	UG/KG	6,800			12	35		410				110 U
Di-n-octylphthalate	UG/KG	0			0	35		240 U				230 U
Fluoranthene	UG/KG	68	500,000	0	11	35		120 U				120 U
Fluorene	UG/KG	0	500,000	0	0	35		92 U				90 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35		93 U				91 U
Hexachlorobutadiene	UG/KG	0			0	35		94 U				92 U
Hexachlorocyclopentadiene	UG/KG	0			0	35		93 U				91 U
Hexachloroethane	UG/KG	1,100			6	35		110 U				110 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35		140 U				140 U
Isophorone	UG/KG	0			0	35		85 U				83 U
Naphthalene	UG/KG	30	500,000	0	5	35		99 U				97 U
Nitrobenzene	UG/KG	0			0	35		100 U				100 U
N-Nitrosodiphenylamine	UG/KG	320			2	35		250 U				240 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35		94 U				92 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35		270 U				260 U
Phenanthrene	UG/KG	46	500,000	0	9	35		94 U				92 U
Phenol	UG/KG	0	500,000	0	0	35		180 U				170 U
Pyrene	UG/KG	110	500,000	0	12	35		110 U				110 U
Herbicides												
2,4,5-T	UG/KG	0			0	35		17 U				17 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35		14 U				14 U
2,4-D	UG/KG	0			0	35		35 U				35 U
2,4-DB	UG/KG	0			0	35		25 U				26 U
Dalapon	UG/KG	0			0	35		9 U				9.1 U
Dicamba	UG/KG	0			0	35		12 U				12 U
Dichloroprop	UG/KG	0			0	35		20 U				21 U
Dinoseb	UG/KG	0			0	35		2.8 U				2.8 U
MCPA	UG/KG	9,400			2	35		2,500 U				2,600 U
MCPP	UG/KG	0			0	35		2,400 U				2,400 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47		55 NJ				59 J
1,3-Dinitrobenzene	UG/KG	0			0	47		7.1 U				6.6 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47		44 J				50 J
2,4-Dinitrotoluene	UG/KG	1,100			36	47		98 J				91 J
2,6-Dinitrotoluene	UG/KG	0			0	47		31 U				29 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47		170 J				190 J
2-Nitrotoluene	UG/KG	0			0	31		14 U				13 U
3,5-Dinitroaniline	UG/KG	0			0	31		4 U				3.8 U
3-Nitrotoluene	UG/KG	0			0	31		9.1 UJ				8.5 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47		180				200
4-Nitrotoluene	UG/KG	0			0	31		31 U				29 U
HMX	UG/KG	470			32	47		97 J				160
Nitrobenzene	UG/KG	0			0	31		25 U				24 U
Nitroglycerine	UG/KG	1,500			1	31		140 U				130 U
Pentaerythritol Tetranitrate	UG/KG	0			0	31		280 U				260 U
RDX	UG/KG	5,800			39	47		190				220
Tetryl	UG/KG	330			4	47		6.2 U				5.8 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Sample ID							S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/16/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34		6.9 U				6.7 U
Aroclor-1221	UG/KG	0	1,000	0	0	34		16 U				16 U
Aroclor-1232	UG/KG	0	1,000	0	0	34		11 U				10 U
Aroclor-1242	UG/KG	0	1,000	0	0	34		6.6 U				6.5 U
Aroclor-1248	UG/KG	0	1,000	0	0	34		7 U				6.8 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34		5.4 U				5.3 U
Aroclor-1260	UG/KG	0	1,000	0	0	34		6.9 U				6.7 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34		0.23 U				2.4 JN
4,4'-DDE	UG/KG	4.2	62,000	0	22	35		1.2 J				1.5 J
4,4'-DDT	UG/KG	3.4	47,000	0	17	34		1 J				2.2 JN
Aldrin	UG/KG	0	680	0	0	34		0.32 U				0.31 U
Alpha-BHC	UG/KG	0	3,400	0	0	34		0.39 U				0.38 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34		0.59 J				0.24 U
Beta-BHC	UG/KG	0	3,000	0	0	34		0.38 U				0.37 U
Delta-BHC	UG/KG	0	500,000	0	0	34		0.37 U				0.36 U
Dieldrin	UG/KG	3.2	1,400	0	14	34		0.25 U				1.2 J
Endosulfan I	UG/KG	55	200,000	0	21	35		0.8 J				1.3 J
Endosulfan II	UG/KG	0.88	200,000	0	1	34		0.39 U				0.38 U
Endosulfan sulfate	UG/KG	0	200,000	0	0	34		0.66 U				0.65 U
Endrin	UG/KG	3.6	89,000	0	1	34		0.97 U				3.6 J
Endrin aldehyde	UG/KG	0			0	34		0.56 U				0.55 U
Endrin ketone	UG/KG	0.58			1	34		0.46 U				0.45 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34		0.31 U				0.3 U
Gamma-Chlordane	UG/KG	1.1			3	34		0.68 J				1.1 J
Heptachlor	UG/KG	0	15,000	0	0	34		0.33 U				0.32 U
Heptachlor epoxide	UG/KG	0			0	34		0.25 U				0.25 U
Methoxychlor	UG/KG	45			1	34		0.57 U				0.56 U
Toxaphene	UG/KG	0			0	34		8 U				7.8 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	27,900	14,400	14,400	17,800	13,000	16,700
Antimony	MG/KG	5.1			32	97	2.8 J	0.14 UJ	0.63 J	0.2 UJ	0.13 UJ	0.21 UJ
Arsenic	MG/KG	12.6	16	0	97	97	6.4	5.4	8.7	7.9	4.2	5.5
Barium	MG/KG	365	400	0	97	97	229 J	134	101	171	71.2	146
Beryllium	MG/KG	1.2	590	0	95	97	1.2 J	0.67	0.62	0.78	0.63	0.79
Cadmium	MG/KG	1,100	9.3	11	77	95	1.1	9	**13.4**	8.7	0.04 J	6.8
Calcium	MG/KG	193,000			96	97	14,800 J	34,600	62,400	25,700	53,200	25,200
Chromium	MG/KG	446	1,500	0	97	97	33.3 J	25.4	35	39.2	23.5	27.9
Cobalt	MG/KG	26.8			97	97	12.5 J	11.8	12.9	13.6	13.3	12.3
Copper	MG/KG	7,310	270	52	97	97	142	**853**	**7,310**	**882**	44.4	**365**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	30,600 J	24,800	60,900	37,600	22,100	30,200
Lead	MG/KG	998	1,000	0	97	97	998 J	54.3	22.3	63.8	15.9	54.6
Magnesium	MG/KG	15,000			97	97	8,740 J	8,140	9,200	7,030	10,800	6,780
Manganese	MG/KG	5,040	10,000	0	97	97	506 J	519	574	635	409	572
Nickel	MG/KG	59.3	310	0	92	92	38.6 J	37.7	54	43.5	45.4	40.7
Potassium	MG/KG	4,880			76	76	4,880 J	1,820 J	2,180 J	2,700 J	2,240 J	2,090 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.21 U	0.32 U	0.59 U	0.43 U	0.28 U	0.46 U
Silver	MG/KG	205	1,500	0	66	97	0.06 U	8.7	53.7	7.3	0.14 J	3 J
Sodium	MG/KG	213			81	97	113	113	151	122	120	88.2 J
Thallium	MG/KG	0.27			6	97	0.09 U	0.27 J	0.25 U	0.18 U	0.12 U	0.19 U
Vanadium	MG/KG	41.9			97	97	40 J	23.8	22.3	29.8	21.3	26.9
Zinc	MG/KG	1,470	10,000	0	92	92	153 J	272	150	335	84.4	336
Mercury	MG/KG	9.1	2.8	49	96	97	0.17	**2.9**	**4.3**	**5.2**	0.02 J	2.7

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01
Sample ID							S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01D
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	DU
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35					83 U	89 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35					90 U	97 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35					80 U	86 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35					88 U	95 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35					160 U	170 U
2,4,6-Trichlorophenol	UG/KG	0			0	35					160 U	170 U
2,4-Dichlorophenol	UG/KG	0			0	35					150 U	160 U
2,4-Dimethylphenol	UG/KG	0			0	35					170 U	180 U
2,4-Dinitrophenol	UG/KG	0			0	35					390 U	410 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35					87 U	94 U
2,6-Dinitrotoluene	UG/KG	700			2	35					81 U	87 U
2-Chloronaphthalene	UG/KG	0			0	35					89 U	96 U
2-Chlorophenol	UG/KG	0			0	35					170 U	180 U
2-Methylnaphthalene	UG/KG	0			0	35					94 U	100 U
2-Methylphenol	UG/KG	0	500,000	0	0	35					200 U	220 U
2-Nitroaniline	UG/KG	0			0	35					77 U	82 U
2-Nitrophenol	UG/KG	0			0	35					170 U	180 U
3 or 4-Methylphenol	UG/KG	0			0	19					190 U	200 U
3,3'-Dichlorobenzidine	UG/KG	0			0	35					120 U	120 U
3-Nitroaniline	UG/KG	0			0	35					96 U	100 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35					340 U	370 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35					87 U	94 U
4-Chloro-3-methylphenol	UG/KG	0			0	35					170 U	180 U
4-Chloroaniline	UG/KG	0			0	35					120 U	130 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35					80 U	86 U
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35					140 U	150 U
4-Nitrophenol	UG/KG	0			0	35					320 U	340 U
Acenaphthene	UG/KG	0	500,000	0	0	35					67 U	72 U
Acenaphthylene	UG/KG	30	500,000	0	3	35					72 U	77 U
Anthracene	UG/KG	18	500,000	0	2	35					86 U	92 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35					88 U	95 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35					95 U	100 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35					140 U	150 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35					110 UJ	110 UJ
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35					85 U	91 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01
Sample ID							S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01D
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	DU
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35					98 U	100 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35					83 U	89 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19					91 U	98 U
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35					100 U	110 U
Butylbenzylphthalate	UG/KG	0			0	35					95 U	100 U
Carbazole	UG/KG	0			0	35					110 U	120 U
Chrysene	UG/KG	130	56,000	0	12	35					97 U	100 U
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35					130 U	140 U
Dibenzofuran	UG/KG	0	350,000	0	0	35					81 U	87 U
Diethyl phthalate	UG/KG	35			1	35					82 U	88 U
Dimethylphthalate	UG/KG	0			0	35					80 U	86 U
Di-n-butylphthalate	UG/KG	6,800			12	35					100 U	110 U
Di-n-octylphthalate	UG/KG	0			0	35					220 U	230 U
Fluoranthene	UG/KG	68	500,000	0	11	35					110 U	120 U
Fluorene	UG/KG	0	500,000	0	0	35					83 U	89 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35					110 J	90 UJ
Hexachlorobutadiene	UG/KG	0			0	35					85 U	91 U
Hexachlorocyclopentadiene	UG/KG	0			0	35					84 U	90 U
Hexachloroethane	UG/KG	1,100			6	35					98 U	100 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35					120 U	130 U
Isophorone	UG/KG	0			0	35					77 U	82 U
Naphthalene	UG/KG	30	500,000	0	5	35					89 U	96 U
Nitrobenzene	UG/KG	0			0	35					93 U	100 U
N-Nitrosodiphenylamine	UG/KG	320			2	35					220 U	240 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35					85 U	91 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35					240 U	260 U
Phenanthrene	UG/KG	46	500,000	0	9	35					85 U	91 U
Phenol	UG/KG	0	500,000	0	0	35					160 U	170 U
Pyrene	UG/KG	110	500,000	0	12	35					100 U	110 U
Herbicides												
2,4,5-T	UG/KG	0			0	35					16 U	18 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35					13 U	14 U
2,4-D	UG/KG	0			0	35					33 U	37 U
2,4-DB	UG/KG	0			0	35					24 U	27 U
Dalapon	UG/KG	0			0	35					8.6 U	9.5 U
Dicamba	UG/KG	0			0	35					11 U	13 U
Dichloroprop	UG/KG	0			0	35					19 U	22 U
Dinoseb	UG/KG	0			0	35					2.7 U	3 U
MCPA	UG/KG	9,400			2	35					2,400 U	2,700 U
MCPP	UG/KG	0			0	35					2,300 U	2,500 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47					7.1 UJ	50 NJ
1,3-Dinitrobenzene	UG/KG	0			0	47					6.5 U	6 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47					68 J	49 J
2,4-Dinitrotoluene	UG/KG	1,100			36	47					120	57 J
2,6-Dinitrotoluene	UG/KG	0			0	47					28 U	26 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47					330	110 J
2-Nitrotoluene	UG/KG	0			0	31					13 U	12 U
3,5-Dinitroaniline	UG/KG	0			0	31					3.7 U	3.4 U
3-Nitrotoluene	UG/KG	0			0	31					8.3 UJ	7.6 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47					500	150
4-Nitrotoluene	UG/KG	0			0	31					28 U	26 U
HMX	UG/KG	470			32	47					9.1 UJ	43 J
Nitrobenzene	UG/KG	0			0	31					23 U	21 U
Nitroglycerine	UG/KG	1,500			1	31					130 U	120 U
Pentaerythritol Tetranitrate	UG/KG	0			0	31					250 U	230 U
RDX	UG/KG	5,800			39	47					230 NJ	75 J
Tetryl	UG/KG	330			4	47					5.7 U	5.2 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01
Sample ID							S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01D
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	DU
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34					5.9 U	6.9 U
Aroclor-1221	UG/KG	0	1,000	0	0	34					14 U	16 U
Aroclor-1232	UG/KG	0	1,000	0	0	34					9.2 U	11 U
Aroclor-1242	UG/KG	0	1,000	0	0	34					5.7 U	6.7 U
Aroclor-1248	UG/KG	0	1,000	0	0	34					6 U	7 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34					4.6 U	5.4 U
Aroclor-1260	UG/KG	0	1,000	0	0	34					5.9 U	6.9 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34					0.2 U	0.23 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35					1.1 J	0.67 J
4,4'-DDT	UG/KG	3.4	47,000	0	17	34					0.31 U	0.68 J
Aldrin	UG/KG	0	680	0	0	34					0.28 U	0.32 U
Alpha-BHC	UG/KG	0	3,400	0	0	34					0.34 U	0.39 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34					0.21 U	0.24 U
Beta-BHC	UG/KG	0	3,000	0	0	34					0.33 U	0.38 U
Delta-BHC	UG/KG	0	500,000	0	0	34					0.32 U	0.37 U
Dieldrin	UG/KG	3.2	1,400	0	14	34					0.22 U	0.81 J
Endosulfan I	UG/KG	55	200,000	0	21	35					1.2 J	0.77 J
Endosulfan II	UG/KG	0.88	200,000	0	1	34					0.34 U	0.39 U
Endosulfan sulfate	UG/KG	0	200,000	0	0	34					0.57 U	0.67 U
Endrin	UG/KG	3.6	89,000	0	1	34					0.84 U	0.98 U
Endrin aldehyde	UG/KG	0			0	34					0.48 U	0.56 U
Endrin ketone	UG/KG	0.58			1	34					0.4 U	0.46 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34					0.27 U	0.31 U
Gamma-Chlordane	UG/KG	1.1			3	34					0.23 U	0.26 U
Heptachlor	UG/KG	0	15,000	0	0	34					0.29 U	0.33 U
Heptachlor epoxide	UG/KG	0			0	34					0.22 U	0.25 U
Methoxychlor	UG/KG	45			1	34					0.5 U	0.58 U
Toxaphene	UG/KG	0			0	34					6.9 U	8 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	16,400	12,500	16,500	12,500	11,900	17,100
Antimony	MG/KG	5.1			32	97	0.2 UJ	1.5 J	0.29 J	0.38 J	0.15 UJ	0.2 UJ
Arsenic	MG/KG	12.6	16	0	97	97	5.5	4.2	4.8	5.8	4.3	5.1
Barium	MG/KG	365	400	0	97	97	126	190	227	191	159	187
Beryllium	MG/KG	1.2	590	0	95	97	0.79	0.55	0.73	0.6	0.53	0.76
Cadmium	MG/KG	1,100	9.3	11	77	95	3.5	4.6	7.6	6.1	5.6	7.7
Calcium	MG/KG	193,000			96	97	28,900	101,000	29,500	30,900	24,400	28,100
Chromium	MG/KG	446	1,500	0	97	97	26.2	21.3	26.7	19.7	20.9	27.3
Cobalt	MG/KG	26.8			97	97	12.5	10	11.3	9.6	9.3	11.4
Copper	MG/KG	7,310	270	52	97	97	132	165	**2,490**	172	143	**330**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	27,800	20,300	25,600	23,000	22,200	25,600
Lead	MG/KG	998	1,000	0	97	97	33.4	62.8	91	83.6	86.3	70.9
Magnesium	MG/KG	15,000			97	97	7,010	7,450	7,380	6,020	6,170	7,980
Manganese	MG/KG	5,040	10,000	0	97	97	616	727	407	389	423	515
Nickel	MG/KG	59.3	310	0	92	92	37.1	31	38.2	30	30.6	37.7
Potassium	MG/KG	4,880			76	76	2,140 J	1,780 J	2,400 J	1,780 J	1,700 J	2,680 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.43 U	0.32 U	0.4 U	0.23 U	0.33 U	0.45 U
Silver	MG/KG	205	1,500	0	66	97	0.72 J	0.31 J	0.63 J	0.78 J	0.56 J	2.2 J
Sodium	MG/KG	213			81	97	199	213	189	199	146	211
Thallium	MG/KG	0.27			6	97	0.18 U	0.14 U	0.17 U	0.25 J	0.14 U	0.19 U
Vanadium	MG/KG	41.9			97	97	26.5	20.8	26.9	20.6	20.8	28.5
Zinc	MG/KG	1,470	10,000	0	92	92	198	463	1,470	535	387	434
Mercury	MG/KG	9.1	2.8	49	96	97	1.1	**6**	**9.1**	**7.6**	**7**	**6.8**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Sample ID							S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/15/2010	3/15/2010	3/15/2010	3/15/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16						
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16						
1,1,2-Trichloroethane	UG/KG	0			0	16						
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16						
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16						
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16						
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16						
1,2-Dichloropropane	UG/KG	0			0	16						
Acetone	UG/KG	0	500,000	0	0	16						
Benzene	UG/KG	0	44,000	0	0	16						
Bromodichloromethane	UG/KG	0			0	16						
Bromoform	UG/KG	0			0	16						
Carbon disulfide	UG/KG	0			0	16						
Carbon tetrachloride	UG/KG	0	22,000	0	0	16						
Chlorobenzene	UG/KG	0	500,000	0	0	16						
Chlorodibromomethane	UG/KG	0			0	16						
Chloroethane	UG/KG	0			0	16						
Chloroform	UG/KG	0	350,000	0	0	16						
Cis-1,3-Dichloropropene	UG/KG	0			0	16						
Ethyl benzene	UG/KG	0	390,000	0	0	16						
Methyl bromide	UG/KG	0			0	16						
Methyl butyl ketone	UG/KG	0			0	16						
Methyl chloride	UG/KG	0			0	16						
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16						
Methyl isobutyl ketone	UG/KG	0			0	16						
Methylene chloride	UG/KG	0	500,000	0	0	16						
Styrene	UG/KG	0			0	16						
Tetrachloroethene	UG/KG	19	150,000	0	6	16						
Toluene	UG/KG	0	500,000	0	0	16						
Total Xylenes	UG/KG	0	500,000	0	0	16						
Trans-1,3-Dichloropropene	UG/KG	0			0	16						
Trichloroethene	UG/KG	0	200,000	0	0	16						
Vinyl chloride	UG/KG	0	13,000	0	0	16						
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35					94 U	
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35					100 U	
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35					90 U	
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35					100 U	
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16						
2,4,5-Trichlorophenol	UG/KG	0			0	35					180 U	
2,4,6-Trichlorophenol	UG/KG	0			0	35					180 U	
2,4-Dichlorophenol	UG/KG	0			0	35					170 U	
2,4-Dimethylphenol	UG/KG	0			0	35					190 U	
2,4-Dinitrophenol	UG/KG	0			0	35					440 U	
2,4-Dinitrotoluene	UG/KG	14,000			13	35					2,500	
2,6-Dinitrotoluene	UG/KG	700			2	35					92 U	
2-Chloronaphthalene	UG/KG	0			0	35					100 U	
2-Chlorophenol	UG/KG	0			0	35					190 U	
2-Methylnaphthalene	UG/KG	0			0	35					110 U	
2-Methylphenol	UG/KG	0	500,000	0	0	35					230 U	
2-Nitroaniline	UG/KG	0			0	35					87 U	
2-Nitrophenol	UG/KG	0			0	35					190 U	
3 or 4-Methylphenol	UG/KG	0			0	19					220 U	
3,3'-Dichlorobenzidine	UG/KG	0			0	35					130 U	
3-Nitroaniline	UG/KG	0			0	35					110 U	
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35					390 U	
4-Bromophenyl phenyl ether	UG/KG	0			0	35					99 U	
4-Chloro-3-methylphenol	UG/KG	0			0	35					190 U	
4-Chloroaniline	UG/KG	0			0	35					140 U	
4-Chlorophenyl phenyl ether	UG/KG	0			0	35					90 U	
4-Methylphenol	UG/KG	0	500,000	0	0	16						
4-Nitroaniline	UG/KG	0			0	35					160 U	
4-Nitrophenol	UG/KG	0			0	35					360 U	
Acenaphthene	UG/KG	0	500,000	0	0	35					75 U	
Acenaphthylene	UG/KG	30	500,000	0	3	35					81 U	
Anthracene	UG/KG	18	500,000	0	2	35					97 U	
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35					100 U	
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35					110 U	
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35					160 U	
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35					120 UJ	
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35					96 U	

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Sample ID							S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/15/2010	3/15/2010	3/15/2010	3/15/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35					110 U	
Bis(2-Chloroethyl)ether	UG/KG	0			0	35					94 U	
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19					100 U	
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35					110 U	
Butylbenzylphthalate	UG/KG	0			0	35					110 U	
Carbazole	UG/KG	0			0	35					130 U	
Chrysene	UG/KG	130	56,000	0	12	35					110 U	
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35					150 U	
Dibenzofuran	UG/KG	0	350,000	0	0	35					92 U	
Diethyl phthalate	UG/KG	35			1	35					93 U	
Dimethylphthalate	UG/KG	0			0	35					90 U	
Di-n-butylphthalate	UG/KG	6,800			12	35					2,600	
Di-n-octylphthalate	UG/KG	0			0	35					240 U	
Fluoranthene	UG/KG	68	500,000	0	11	35					120 U	
Fluorene	UG/KG	0	500,000	0	0	35					94 U	
Hexachlorobenzene	UG/KG	110	6,000	0	11	35					95 U	
Hexachlorobutadiene	UG/KG	0			0	35					96 U	
Hexachlorocyclopentadiene	UG/KG	0			0	35					95 U	
Hexachloroethane	UG/KG	1,100			6	35					110 U	
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35					140 U	
Isophorone	UG/KG	0			0	35					87 U	
Naphthalene	UG/KG	30	500,000	0	5	35					100 U	
Nitrobenzene	UG/KG	0			0	35					100 U	
N-Nitrosodiphenylamine	UG/KG	320			2	35					320 J	
N-Nitrosodipropylamine	UG/KG	1,600			5	35					96 U	
Pentachlorophenol	UG/KG	0	6,700	0	0	35					280 U	
Phenanthrene	UG/KG	46	500,000	0	9	35					96 U	
Phenol	UG/KG	0	500,000	0	0	35					180 U	
Pyrene	UG/KG	110	500,000	0	12	35					120 U	
Herbicides												
2,4,5-T	UG/KG	0			0	35					18 U	
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35					14 U	
2,4-D	UG/KG	0			0	35					36 U	
2,4-DB	UG/KG	0			0	35					26 U	
Dalapon	UG/KG	0			0	35					9.2 U	
Dicamba	UG/KG	0			0	35					12 U	
Dichloroprop	UG/KG	0			0	35					21 U	
Dinoseb	UG/KG	0			0	35					2.9 U	
MCPA	UG/KG	9,400			2	35					2,600 U	
MCPP	UG/KG	0			0	35					2,400 U	
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47					45 J	
1,3-Dinitrobenzene	UG/KG	0			0	47					6.4 U	
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47					37 J	
2,4-Dinitrotoluene	UG/KG	1,100			36	47					86 J	
2,6-Dinitrotoluene	UG/KG	0			0	47					28 U	
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47					150 J	
2-Nitrotoluene	UG/KG	0			0	31					12 U	
3,5-Dinitroaniline	UG/KG	0			0	31					3.6 U	
3-Nitrotoluene	UG/KG	0			0	31					8.2 UJ	
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47					150 J	
4-Nitrotoluene	UG/KG	0			0	31					28 U	
HMX	UG/KG	470			32	47					180	
Nitrobenzene	UG/KG	0			0	31					23 U	
Nitroglycerine	UG/KG	1,500			1	31					130 U	
Pentaerythritol Tetranitrate	UG/KG	0			0	31					250 U	
RDX	UG/KG	5,800			39	47					310	
Tetryl	UG/KG	330			4	47					5.6 U	

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Sample ID							S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date							3/15/2010	3/15/2010	3/15/2010	3/15/2010	3/12/2010	3/12/2010
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34					7.1 U	
Aroclor-1221	UG/KG	0	1,000	0	0	34					16 U	
Aroclor-1232	UG/KG	0	1,000	0	0	34					11 U	
Aroclor-1242	UG/KG	0	1,000	0	0	34					6.8 U	
Aroclor-1248	UG/KG	0	1,000	0	0	34					7.2 U	
Aroclor-1254	UG/KG	2,000	1,000	1	2	34					5.5 U	
Aroclor-1260	UG/KG	0	1,000	0	0	34					7.1 U	
4,4'-DDD	UG/KG	2.4	92,000	0	2	34					0.24 U	
4,4'-DDE	UG/KG	4.2	62,000	0	22	35					0.9 J	
4,4'-DDT	UG/KG	3.4	47,000	0	17	34					0.77 J	
Aldrin	UG/KG	0	680	0	0	34					0.33 U	
Alpha-BHC	UG/KG	0	3,400	0	0	34					0.4 U	
Alpha-Chlordane	UG/KG	2	24,000	0	4	34					0.25 U	
Beta-BHC	UG/KG	0	3,000	0	0	34					0.39 U	
Delta-BHC	UG/KG	0	500,000	0	0	34					0.38 U	
Dieldrin	UG/KG	3.2	1,400	0	14	34					0.79 J	
Endosulfan I	UG/KG	55	200,000	0	21	35					0.74 J	
Endosulfan II	UG/KG	0.88	200,000	0	1	34					0.4 U	
Endosulfan sulfate	UG/KG	0	200,000	0	0	34					0.68 U	
Endrin	UG/KG	3.6	89,000	0	1	34					1 U	
Endrin aldehyde	UG/KG	0			0	34					0.58 U	
Endrin ketone	UG/KG	0.58			1	34					0.47 U	
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34					0.32 U	
Gamma-Chlordane	UG/KG	1.1			3	34					0.27 U	
Heptachlor	UG/KG	0	15,000	0	0	34					0.34 U	
Heptachlor epoxide	UG/KG	0			0	34					0.26 U	
Methoxychlor	UG/KG	45			1	34					0.59 U	
Toxaphene	UG/KG	0			0	34					8.2 U	
Inorganics												
Aluminum	MG/KG	27,900			97	97	16,500 J	21,700 J	17,400 J	14,400 J	17,800	15,000
Antimony	MG/KG	5.1			32	97	0.2 UJ	5.1 J	0.38 J	0.69 U	0.12 UJ	0.58 J
Arsenic	MG/KG	12.6	16	0	97	97	4.7 J	4.6 J	4.6 J	3.9 J	5	5.7
Barium	MG/KG	365	400	0	97	97	158 J	173 J	154 J	126 J	170	153
Beryllium	MG/KG	1.2	590	0	95	97	0.75 J	0.7 J	0.74 J	0.62 J	0.79	0.7
Cadmium	MG/KG	1,100	9.3	11	77	95	7.9 J	6.9 J	6.1 J	2.8 J	7.3	8.1
Calcium	MG/KG	193,000			96	97	23,000 J	34,100 J	28,800 J	37,700 J	27,600	30,900
Chromium	MG/KG	446	1,500	0	97	97	28.1 J	26.7 J	26 J	22.8 J	27.4	25
Cobalt	MG/KG	26.8			97	97	12.1 J	9.2 J	9.4 J	10 J	10.8	11.3
Copper	MG/KG	7,310	270	52	97	97	**378 J**	**716 J**	**311 J**	266 J	**343**	**416**
Cyanide	MG/KG	0.7	27	0	2	16						
Iron	MG/KG	118,000			97	97	26,900 J	23,400 J	24,300 J	21,500 J	27,500	24,800
Lead	MG/KG	998	1,000	0	97	97	58.3 J	153 J	45.7 J	42.7 J	64.9	57.4
Magnesium	MG/KG	15,000			97	97	7,310 J	7,810 J	9,350 J	8,470 J	7,170	12,100
Manganese	MG/KG	5,040	10,000	0	97	97	580 J	566 J	502 J	420 J	531	577
Nickel	MG/KG	59.3	310	0	92	92	40.8 J	39 J	33.9 J	34.8 J	37.9	35.8
Potassium	MG/KG	4,880			76	76	2,310 J	3,220 J	3,510 J	2,590 J	2,710 J	2,010 J
Selenium	MG/KG	0.92	1,500	0	4	97	0.44 UJ	0.22 UJ	0.21 UJ	0.19 UJ	0.26 U	0.41 U
Silver	MG/KG	205	1,500	0	66	97	2.5 J	1.5 U	2.9 J	1.3 U	2.4	3.6
Sodium	MG/KG	213			81	97	101 J	149 J	101 J	137 J	198	195
Thallium	MG/KG	0.27			6	97	0.18 UJ	0.09 UJ	0.09 UJ	0.08 UJ	0.11 U	0.17 U
Vanadium	MG/KG	41.9			97	97	27.6 J	29 J	28.3 J	23 J	28.1	25.7
Zinc	MG/KG	1,470	10,000	0	92	92	315 J	585 J	294 J	241 J	317	304
Mercury	MG/KG	9.1	2.8	49	96	97	2.6 J	**8 J**	**3.2 J**	**3.2 J**	2.4	**4.4**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Sample ID							S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0-0.2	0-0.2	0-0.2
Sample Date							3/12/2010	3/12/2010	3/12/2010	10/25/1993	10/25/1993	10/25/1993
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	ESI	ESI	ESI
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16				12 U	11 U	12 U
1,1,2-Trichloroethane	UG/KG	0			0	16				12 U	11 U	12 U
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16				12 U	11 U	12 U
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16				12 U	11 U	12 U
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
1,2-Dichloropropane	UG/KG	0			0	16				12 U	11 U	12 U
Acetone	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
Benzene	UG/KG	0	44,000	0	0	16				12 U	11 U	12 U
Bromodichloromethane	UG/KG	0			0	16				12 U	11 U	12 U
Bromoform	UG/KG	0			0	16				12 U	11 U	12 U
Carbon disulfide	UG/KG	0			0	16				12 U	11 U	12 U
Carbon tetrachloride	UG/KG	0	22,000	0	0	16				12 U	11 U	12 U
Chlorobenzene	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
Chlorodibromomethane	UG/KG	0			0	16				12 U	11 U	12 U
Chloroethane	UG/KG	0			0	16				12 U	11 U	12 U
Chloroform	UG/KG	0	350,000	0	0	16				12 U	11 U	12 U
Cis-1,3-Dichloropropene	UG/KG	0			0	16				12 U	11 U	12 U
Ethyl benzene	UG/KG	0	390,000	0	0	16				12 U	11 U	12 U
Methyl bromide	UG/KG	0			0	16				12 U	11 U	12 U
Methyl butyl ketone	UG/KG	0			0	16				12 U	11 U	12 U
Methyl chloride	UG/KG	0			0	16				12 U	11 U	12 U
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
Methyl isobutyl ketone	UG/KG	0			0	16				12 U	11 U	12 U
Methylene chloride	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
Styrene	UG/KG	0			0	16				12 U	11 U	12 U
Tetrachloroethene	UG/KG	19	150,000	0	6	16				12 U	11 U	12 U
Toluene	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
Total Xylenes	UG/KG	0	500,000	0	0	16				12 U	11 U	12 U
Trans-1,3-Dichloropropene	UG/KG	0			0	16				12 U	11 U	12 U
Trichloroethene	UG/KG	0	200,000	0	0	16				12 U	11 U	12 U
Vinyl chloride	UG/KG	0	13,000	0	0	16				12 U	11 U	12 U
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35				410 U	380 U	400 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35				410 U	380 U	400 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35				410 U	380 U	400 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35				410 U	380 U	400 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16				410 U	380 U	400 U
2,4,5-Trichlorophenol	UG/KG	0			0	35				1,000 U	930 U	960 U
2,4,6-Trichlorophenol	UG/KG	0			0	35				410 U	380 U	400 U
2,4-Dichlorophenol	UG/KG	0			0	35				410 U	380 U	400 U
2,4-Dimethylphenol	UG/KG	0			0	35				410 U	380 U	400 U
2,4-Dinitrophenol	UG/KG	0			0	35				1,000 U	930 U	960 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35				410 U	380 U	400 U
2,6-Dinitrotoluene	UG/KG	700			2	35				410 U	380 U	400 U
2-Chloronaphthalene	UG/KG	0			0	35				410 U	380 U	400 U
2-Chlorophenol	UG/KG	0			0	35				410 U	380 U	400 U
2-Methylnaphthalene	UG/KG	0			0	35				410 U	380 U	400 U
2-Methylphenol	UG/KG	0	500,000	0	0	35				410 U	380 U	400 U
2-Nitroaniline	UG/KG	0			0	35				1,000 U	930 U	960 U
2-Nitrophenol	UG/KG	0			0	35				410 U	380 U	400 U
3 or 4-Methylphenol	UG/KG	0			0	19						
3,3'-Dichlorobenzidine	UG/KG	0			0	35				410 U	380 U	400 U
3-Nitroaniline	UG/KG	0			0	35				1,000 U	930 U	960 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35				1,000 U	930 U	960 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35				410 U	380 U	400 U
4-Chloro-3-methylphenol	UG/KG	0			0	35				410 U	380 U	400 U
4-Chloroaniline	UG/KG	0			0	35				410 U	380 U	400 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35				410 U	380 U	400 U
4-Methylphenol	UG/KG	0	500,000	0	0	16				410 U	380 U	400 U
4-Nitroaniline	UG/KG	0			0	35				1,000 U	930 U	960 U
4-Nitrophenol	UG/KG	0			0	35				1,000 U	930 U	960 U
Acenaphthene	UG/KG	0	500,000	0	0	35				410 U	380 U	400 U
Acenaphthylene	UG/KG	30	500,000	0	3	35				410 U	380 U	400 U
Anthracene	UG/KG	18	500,000	0	2	35				410 U	380 U	400 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35				410 U	380 U	400 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35				410 U	380 U	400 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35				410 U	380 U	400 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35				410 U	380 U	400 U
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35				410 U	380 U	400 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Sample ID							S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0-0.2	0-0.2	0-0.2
Sample Date							3/12/2010	3/12/2010	3/12/2010	10/25/1993	10/25/1993	10/25/1993
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	ESI	ESI	ESI
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35				410 U	380 U	400 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35				410 U	380 U	400 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19						
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35				410 U	380 U	700
Butylbenzylphthalate	UG/KG	0			0	35				410 U	380 U	400 U
Carbazole	UG/KG	0			0	35				410 U	380 U	400 U
Chrysene	UG/KG	130	56,000	0	12	35				410 U	380 U	400 U
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35				410 U	380 U	400 U
Dibenzofuran	UG/KG	0	350,000	0	0	35				410 U	380 U	400 U
Diethyl phthalate	UG/KG	35			1	35				410 U	380 U	400 U
Dimethylphthalate	UG/KG	0			0	35				410 U	380 U	400 U
Di-n-butylphthalate	UG/KG	6,800			12	35				410 U	380 U	400 U
Di-n-octylphthalate	UG/KG	0			0	35				410 U	380 U	400 U
Fluoranthene	UG/KG	68	500,000	0	11	35				410 U	380 U	400 U
Fluorene	UG/KG	0	500,000	0	0	35				410 U	380 U	400 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35				410 U	380 U	400 U
Hexachlorobutadiene	UG/KG	0			0	35				410 U	380 U	400 U
Hexachlorocyclopentadiene	UG/KG	0			0	35				410 U	380 U	400 U
Hexachloroethane	UG/KG	1,100			6	35				410 U	380 U	400 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35				410 U	380 U	400 U
Isophorone	UG/KG	0			0	35				410 U	380 U	400 U
Naphthalene	UG/KG	30	500,000	0	5	35				410 U	380 U	400 U
Nitrobenzene	UG/KG	0			0	35				410 U	380 U	400 U
N-Nitrosodiphenylamine	UG/KG	320			2	35				410 U	380 U	400 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35				410 U	380 U	400 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35				1,000 U	930 U	960 U
Phenanthrene	UG/KG	46	500,000	0	9	35				410 U	380 U	400 U
Phenol	UG/KG	0	500,000	0	0	35				410 U	380 U	400 U
Pyrene	UG/KG	110	500,000	0	12	35				410 U	380 U	400 U
Herbicides												
2,4,5-T	UG/KG	0			0	35				6.3 U	5.8 U	6 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35				6.3 U	5.8 U	6 U
2,4-D	UG/KG	0			0	35				63 U	58 U	60 U
2,4-DB	UG/KG	0			0	35				63 U	58 U	60 U
Dalapon	UG/KG	0			0	35				150 U	140 U	150 U
Dicamba	UG/KG	0			0	35				6.3 U	5.8 U	6 U
Dichloroprop	UG/KG	0			0	35				63 U	58 U	60 U
Dinoseb	UG/KG	0			0	35				32 U	29 U	30 U
MCPA	UG/KG	9,400			2	35				9,400	6,300	6,000 U
MCPP	UG/KG	0			0	35				6,300 U	5,800 U	6,000 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47				130 U	130 U	100 J
1,3-Dinitrobenzene	UG/KG	0			0	47				130 U	130 U	130 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47				130 U	130 U	96 J
2,4-Dinitrotoluene	UG/KG	1,100			36	47				130 U	130 U	130 U
2,6-Dinitrotoluene	UG/KG	0			0	47				130 U	130 U	130 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47				130 U	130 U	99 J
2-Nitrotoluene	UG/KG	0			0	31						
3,5-Dinitroaniline	UG/KG	0			0	31						
3-Nitrotoluene	UG/KG	0			0	31						
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47				130 U	130 U	130 U
4-Nitrotoluene	UG/KG	0			0	31						
HMX	UG/KG	470			32	47				130 U	130 U	130 U
Nitrobenzene	UG/KG	0			0	31						
Nitroglycerine	UG/KG	1,500			1	31						
Pentaerythritol Tetranitrate	UG/KG	0			0	31						
RDX	UG/KG	5,800			39	47				130 U	130 U	100 J
Tetryl	UG/KG	330			4	47				130 U	130 U	130 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Sample ID							S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0.2-0.6	0.2-0.6	0.2-0.6	0-0.2	0-0.2	0-0.2
Sample Date							3/12/2010	3/12/2010	3/12/2010	10/25/1993	10/25/1993	10/25/1993
QC Type							SA	SA	SA	SA	SA	SA
Study ID							OD Initial Invest	OD Initial Invest	OD Initial Invest	ESI	ESI	ESI
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34				41 U	38 U	40 U
Aroclor-1221	UG/KG	0	1,000	0	0	34				84 U	78 U	81 U
Aroclor-1232	UG/KG	0	1,000	0	0	34				41 U	38 U	40 U
Aroclor-1242	UG/KG	0	1,000	0	0	34				41 U	38 U	40 U
Aroclor-1248	UG/KG	0	1,000	0	0	34				41 U	38 U	40 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34				41 U	38 U	40 U
Aroclor-1260	UG/KG	0	1,000	0	0	34				41 U	38 U	40 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34				4.1 U	3.8 U	4 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35				4.1 U	3.8 U	4 U
4,4'-DDT	UG/KG	3.4	47,000	0	17	34				4.1 U	3.8 U	4 U
Aldrin	UG/KG	0	680	0	0	34				2.1 U	2 U	2 U
Alpha-BHC	UG/KG	0	3,400	0	0	34				2.1 U	2 U	2 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34				2.1 U	2 U	2 U
Beta-BHC	UG/KG	0	3,000	0	0	34				2.1 U	2 U	2 U
Delta-BHC	UG/KG	0	500,000	0	0	34				2.1 U	2 U	2 U
Dieldrin	UG/KG	3.2	1,400	0	14	34				4.1 U	3.8 U	4 U
Endosulfan I	UG/KG	55	200,000	0	21	35				2.1 U	2 U	2 U
Endosulfan II	UG/KG	0.88	200,000	0	1	34				4.1 U	3.8 U	4 U
Endosulfan sulfate	UG/KG	0	200,000	0	0	34				4.1 U	3.8 U	4 U
Endrin	UG/KG	3.6	89,000	0	1	34				4.1 U	3.8 U	4 U
Endrin aldehyde	UG/KG	0			0	34				4.1 U	3.8 U	4 U
Endrin ketone	UG/KG	0.58			1	34				4.1 U	3.8 U	4 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34				2.1 U	2 U	2 U
Gamma-Chlordane	UG/KG	1.1			3	34				2.1 U	2 U	2 U
Heptachlor	UG/KG	0	15,000	0	0	34				2.1 U	2 U	2 U
Heptachlor epoxide	UG/KG	0			0	34				2.1 U	2 U	2 U
Methoxychlor	UG/KG	45			1	34				21 U	20 U	20 U
Toxaphene	UG/KG	0			0	34				210 U	200 U	200 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	12,700	9,690	10,800	17,300	19,400	18,900
Antimony	MG/KG	5.1			32	97	0.19 UJ	0.16 J	0.14 UJ	10 UJ	11.5 UJ	10.8 UJ
Arsenic	MG/KG	12.6	16	0	97	97	5	3.3	5.4	5	5.5	5.1
Barium	MG/KG	365	400	0	97	97	151	108	76.1	122	194	115
Beryllium	MG/KG	1.2	590	0	95	97	0.58	0.42 J	0.54	0.7 J	0.77 J	0.83 J
Cadmium	MG/KG	1,100	9.3	11	77	95	4.5	1.8	0.01 U	2.8	2.4	1.1
Calcium	MG/KG	193,000			96	97	41,800	40,400	53,900	8,510	10,300	21,800
Chromium	MG/KG	446	1,500	0	97	97	22.8	14.4	18.8	24.1	39.3	27.4
Cobalt	MG/KG	26.8			97	97	10.4	6.4	11	10.8	24.3	14.1
Copper	MG/KG	7,310	270	52	97	97	240	115	24.7	79.4	192	55.8
Cyanide	MG/KG	0.7	27	0	2	16				0.56 U	0.57 U	0.58 U
Iron	MG/KG	118,000			97	97	25,300	15,500	19,000	25,800	75,700	30,500
Lead	MG/KG	998	1,000	0	97	97	50.9	30.3	11.2	20.4	15.7	12
Magnesium	MG/KG	15,000			97	97	10,300	12,500	8,380	5,530	5,950	6,790
Manganese	MG/KG	5,040	10,000	0	97	97	466	380	379	562	1,150	627
Nickel	MG/KG	59.3	310	0	92	92	35.5	20	34.3	29.4 UR	41.3 UR	40.5 UR
Potassium	MG/KG	4,880			76	76	1,890 J	1,870 J	1,790 J	2,310	3,140	2,720
Selenium	MG/KG	0.92	1,500	0	4	97	0.56 J	0.22 U	0.3 U	0.27 U	0.18 U	0.21 U
Silver	MG/KG	205	1,500	0	66	97	1.4 J	0.38 J	0.12 J	1.3 UJ	1.5 UJ	2.1
Sodium	MG/KG	213			81	97	196	166	188	67.1 J	100 J	114 J
Thallium	MG/KG	0.27			6	97	0.18 U	0.09 U	0.15 J	0.29 UJ	0.2 UJ	0.23 UJ
Vanadium	MG/KG	41.9			97	97	21.7	17.5	18.5	28.6	35.4	30.5
Zinc	MG/KG	1,470	10,000	0	92	92	371	336	80.1	148 UR	122 UR	115 UR
Mercury	MG/KG	9.1	2.8	49	96	97	**9.1**	**6.7**	0.04	0.43	0.63	0.17

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SS45-4	SS45-5	SS45-5	SS45-6	SS45-7	SS45-8
Sample ID							SS45-4	SS45-10	SS45-5	SS45-6	SS45-7	SS45-8
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Sample Date							10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993
QC Type							SA	DU	SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds												
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1,2-Trichloroethane	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
1,2-Dichloropropane	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Acetone	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Benzene	UG/KG	0	44,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Bromodichloromethane	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Bromoform	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Carbon disulfide	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Carbon tetrachloride	UG/KG	0	22,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Chlorobenzene	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Chlorodibromomethane	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Chloroethane	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Chloroform	UG/KG	0	350,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Cis-1,3-Dichloropropene	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Ethyl benzene	UG/KG	0	390,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl bromide	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl butyl ketone	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl chloride	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl isobutyl ketone	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Methylene chloride	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Styrene	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Tetrachloroethene	UG/KG	19	150,000	0	6	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Toluene	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Total Xylenes	UG/KG	0	500,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Trans-1,3-Dichloropropene	UG/KG	0			0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Trichloroethene	UG/KG	0	200,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Vinyl chloride	UG/KG	0	13,000	0	0	16	11 UJ	12 U	12 U	11 U	11 U	12 U
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16	360 U	390 U	390 U	360 U	380 U	420 U
2,4,5-Trichlorophenol	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
2,4,6-Trichlorophenol	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
2,4-Dichlorophenol	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
2,4-Dimethylphenol	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
2,4-Dinitrophenol	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35	360 U	75 J	160 J	830	380 U	420 U
2,6-Dinitrotoluene	UG/KG	700			2	35	360 U	390 U	390 U	41 J	380 U	420 U
2-Chloronaphthalene	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
2-Chlorophenol	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
2-Methylnaphthalene	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
2-Methylphenol	UG/KG	0	500,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
2-Nitroaniline	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
2-Nitrophenol	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
3 or 4-Methylphenol	UG/KG	0			0	19						
3,3'-Dichlorobenzidine	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
3-Nitroaniline	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
4-Chloro-3-methylphenol	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
4-Chloroaniline	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
4-Methylphenol	UG/KG	0	500,000	0	0	16	360 U	390 U	390 U	360 U	380 U	420 U
4-Nitroaniline	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
4-Nitrophenol	UG/KG	0			0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
Acenaphthene	UG/KG	0	500,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
Acenaphthylene	UG/KG	30	500,000	0	3	35	360 U	390 U	30 J	360 U	380 U	420 U
Anthracene	UG/KG	18	500,000	0	2	35	360 U	390 U	18 J	360 U	380 U	420 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35	360 U	32 J	50 J	31 J	380 U	420 U
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35	360 U	44 J	82 J	45 J	380 U	420 U
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35	360 U	33 J	55 J	36 J	380 U	420 U
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35	360 U	27 J	39 J	360 U	380 U	420 U
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35	360 U	18 J	58 J	360 U	380 U	420 U

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SS45-4	SS45-5	SS45-5	SS45-6	SS45-7	SS45-8
Sample ID							SS45-4	SS45-10	SS45-5	SS45-6	SS45-7	SS45-8
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Sample Date							10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993
QC Type							SA	DU	SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI	ESI	ESI
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19						
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35	430	700	740	360 U	210 J	470
Butylbenzylphthalate	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Carbazole	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Chrysene	UG/KG	130	56,000	0	12	35	19 J	55 J	68 J	52 J	380 U	20 J
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
Dibenzofuran	UG/KG	0	350,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
Diethyl phthalate	UG/KG	35			1	35	360 U	390 U	390 U	360 U	380 U	420 U
Dimethylphthalate	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Di-n-butylphthalate	UG/KG	6,800			12	35	360 U	31 J	110 J	900	380 U	420 U
Di-n-octylphthalate	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Fluoranthene	UG/KG	68	500,000	0	11	35	23 J	44 J	66 J	42 J	380 U	22 J
Fluorene	UG/KG	0	500,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35	20 J	41 J	43 J	55 J	380 U	420 U
Hexachlorobutadiene	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Hexachlorocyclopentadiene	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Hexachloroethane	UG/KG	1,100			6	35	360 U	390 U	390 U	21 J	380 U	420 U
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35	360 U	390 U	52 J	360 U	380 U	420 U
Isophorone	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
Naphthalene	UG/KG	30	500,000	0	5	35	360 U	390 U	21 J	360 U	380 U	420 U
Nitrobenzene	UG/KG	0			0	35	360 U	390 U	390 U	360 U	380 U	420 U
N-Nitrosodiphenylamine	UG/KG	320			2	35	360 U	390 U	390 U	360 U	380 U	420 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35	360 U	390 U	390 U	110 J	380 U	420 U
Pentachlorophenol	UG/KG	0	6,700	0	0	35	870 U	950 U	950 U	870 U	920 U	1,000 U
Phenanthrene	UG/KG	46	500,000	0	9	35	360 U	31 J	38 J	25 J	380 U	420 U
Phenol	UG/KG	0	500,000	0	0	35	360 U	390 U	390 U	360 U	380 U	420 U
Pyrene	UG/KG	110	500,000	0	12	35	35 J	76 J	100 J	79 J	380 U	30 J
Herbicides												
2,4,5-T	UG/KG	0			0	35	5.4 U	6 U	5.9 U	5.5 U	5.7 U	6.3 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35	5.4 U	6 U	5.9 UJ	5.5 U	5.7 U	6.3 U
2,4-D	UG/KG	0			0	35	54 U	60 U	59 U	55 U	57 U	63 U
2,4-DB	UG/KG	0			0	35	54 U	60 U	59 U	55 U	57 U	63 U
Dalapon	UG/KG	0			0	35	130 U	150 U	150 U	130 U	140 U	160 U
Dicamba	UG/KG	0			0	35	5.4 U	6 U	5.9 U	5.5 U	5.7 U	6.3 U
Dichloroprop	UG/KG	0			0	35	54 U	60 U	59 U	55 U	57 U	63 U
Dinoseb	UG/KG	0			0	35	27 U	30 U	30 UJ	28 U	29 U	32 U
MCPA	UG/KG	9,400			2	35	5,400 U	6,000 U	5,900 U	5,500 U	5,700 U	6,300 U
MCPP	UG/KG	0			0	35	5,400 U	6,000 U	5,900 U	5,500 U	5,700 U	6,300 U
Explosives												
1,3,5-Trinitrobenzene	UG/KG	190			28	47	100 U	130 UJ	130 UJ	120 J	130 UJ	130 UJ
1,3-Dinitrobenzene	UG/KG	0			0	47	130 U	130 UJ	130 UJ	130 U	130 UJ	130 UJ
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	130 U	80 J	84 J	190	130 UJ	130 UJ
2,4-Dinitrotoluene	UG/KG	1,100			36	47	110 J	140 J	150 J	160	130 UJ	130 UJ
2,6-Dinitrotoluene	UG/KG	0			0	47	130 U	130 UJ	130 UJ	130 U	130 UJ	130 UJ
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	130 U	270 J	280 J	590	130 UJ	130 UJ
2-Nitrotoluene	UG/KG	0			0	31						
3,5-Dinitroaniline	UG/KG	0			0	31						
3-Nitrotoluene	UG/KG	0			0	31						
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	130 U	130 UJ	130 UJ	130 U	130 UJ	130 UJ
4-Nitrotoluene	UG/KG	0			0	31						
HMX	UG/KG	470			32	47	130 U	140 J	120 J	130 U	130 UJ	130 UJ
Nitrobenzene	UG/KG	0			0	31						
Nitroglycerine	UG/KG	1,500			1	31						
Pentaerythritol Tetranitrate	UG/KG	0			0	31						
RDX	UG/KG	5,800			39	47	82 J	290 J	280 J	1,800	83 J	130 UJ
Tetryl	UG/KG	330			4	47	90 J	130 J	130 UJ	330	130 UJ	130 UJ

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SS45-4	SS45-5	SS45-5	SS45-6	SS45-7	SS45-8
Sample ID							SS45-4	SS45-10	SS45-5	SS45-6	SS45-7	SS45-8
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Sample Date							10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993
QC Type							SA	DU	SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI	ESI	ESI
Pesticides/PCBs												
Aroclor-1016	UG/KG	0	1,000	0	0	34	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1221	UG/KG	0	1,000	0	0	34	73 U	78 U	80 U	73 U	77 U	84 U
Aroclor-1232	UG/KG	0	1,000	0	0	34	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1242	UG/KG	0	1,000	0	0	34	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1248	UG/KG	0	1,000	0	0	34	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34	36 U	110 J	39 U	36 U	38 U	41 U
Aroclor-1260	UG/KG	0	1,000	0	0	34	36 U	38 U	39 U	36 U	38 U	41 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35	3.2 J	3.4 J	3.9 U	4.2 J	3.8 U	4.1 U
4,4'-DDT	UG/KG	3.4	47,000	0	17	34	3.6 U	3.4 J	3.9 U	2.8 J	3.8 U	4.1 U
Aldrin	UG/KG	0	680	0	0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Alpha-BHC	UG/KG	0	3,400	0	0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34	1.5 J	1.1 J	2 U	2 J	1.9 U	2.1 U
Beta-BHC	UG/KG	0	3,000	0	0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Delta-BHC	UG/KG	0	500,000	0	0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Dieldrin	UG/KG	3.2	1,400	0	14	34	2.5 J	3.8 U	3.9 U	3.2 J	3.8 U	4.1 U
Endosulfan I	UG/KG	55	200,000	0	21	35	1.8 U	2 U	1.8 J	1.8 U	1.9 U	2.1 U
Endosulfan II	UG/KG	0.88	200,000	0	1	34	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endosulfan sulfate	UG/KG	0	200,000	0	0	34	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endrin	UG/KG	3.6	89,000	0	1	34	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endrin aldehyde	UG/KG	0			0	34	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endrin ketone	UG/KG	0.58			1	34	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Gamma-Chlordane	UG/KG	1.1			3	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Heptachlor	UG/KG	0	15,000	0	0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Heptachlor epoxide	UG/KG	0			0	34	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Methoxychlor	UG/KG	45			1	34	18 U	20 U	20 U	18 U	19 U	21 U
Toxaphene	UG/KG	0			0	34	180 U	200 U	200 U	180 U	190 U	210 U
Inorganics												
Aluminum	MG/KG	27,900			97	97	14,900	15,600	17,600	16,300	18,000	18,600
Antimony	MG/KG	5.1			32	97	7.9 UJ	10.1 UJ	9.3 UJ	8.5 UJ	9.7 UJ	11.4 UJ
Arsenic	MG/KG	12.6	16	0	97	97	5.1	6.4	6.2	5.5	6.8	6.4
Barium	MG/KG	365	400	0	97	97	143	151	161	160	163	365
Beryllium	MG/KG	1.2	590	0	95	97	0.63 J	0.7 J	0.72 J	0.71 J	0.82 J	0.69 J
Cadmium	MG/KG	1,100	9.3	11	77	95	3.9	**9.5 J**	**9.5 J**	8.8	1.6 J	4.8 J
Calcium	MG/KG	193,000			96	97	47,000	47,000	26,000	23,400	6,930	16,800
Chromium	MG/KG	446	1,500	0	97	97	22.9	23.8	26.9	24.2	24.8	27.2
Cobalt	MG/KG	26.8			97	97	12.4	12.2	12.9	11.7	13.1	12.1
Copper	MG/KG	7,310	270	52	97	97	155	**405**	**538**	**491**	69.8	**293**
Cyanide	MG/KG	0.7	27	0	2	16	0.54 U	0.67 U	0.72 U	0.52 U	0.66 U	0.72 U
Iron	MG/KG	118,000			97	97	26,700	30,400	31,400	28,100	29,900	29,400
Lead	MG/KG	998	1,000	0	97	97	34.9	54.9	63.6	63.2	21.9	66.9
Magnesium	MG/KG	15,000			97	97	8,420	7,000	7,320	6,440	5,170	6,740
Manganese	MG/KG	5,040	10,000	0	97	97	530	599	575	555	1,050	489
Nickel	MG/KG	59.3	310	0	92	92	35.2 UR	36.4	40.5	34.2 UR	35.1	39.4
Potassium	MG/KG	4,880			76	76	2,100	1,980	2,140	2,060	2,080	2,530
Selenium	MG/KG	0.92	1,500	0	4	97	0.23 U	0.22 UJ	0.18 UJ	0.18 U	0.22 UJ	0.24 UJ
Silver	MG/KG	205	1,500	0	66	97	1 UJ	2.7 J	3.5 J	4.3	1.2 UJ	2.3 J
Sodium	MG/KG	213			81	97	142 J	104 J	110 J	112 J	136 J	93.5 J
Thallium	MG/KG	0.27			6	97	0.25 UJ	0.24 U	0.19 U	0.2 UJ	0.24 U	0.26 U
Vanadium	MG/KG	41.9			97	97	23.7	25.8	27.9	27.3	32.5	30
Zinc	MG/KG	1,470	10,000	0	92	92	208 UR	361	427	347 UR	126	306
Mercury	MG/KG	9.1	2.8	49	96	97	0.43	2.1 J	1.5 J	2.4	0.41 J	1.9 J

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SS45-9	TP45-1	TP45-1	TP45-2	TP45-3	TP45-4	TP45-5
Sample ID							SS45-9	TP45-1	TP45-11	TP45-2	TP45-3	TP45-4	TP45-5
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0-0.2	3-3	3-3	3-3	3-3	3-3	3-3
Sample Date							10/25/1993	11/11/1993	11/11/1993	11/11/1993	11/11/1993	11/9/1993	11/9/1993
QC Type							SA	SA	DU	SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds													
1,1,1-Trichloroethane	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1,2-Trichloroethane	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1-Dichloroethane	UG/KG	0	240,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1-Dichloroethene	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,2-Dichloroethane	UG/KG	0	30,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,2-Dichloroethene (total)	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,2-Dichloropropane	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Acetone	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	31 U	11 U	11 U
Benzene	UG/KG	0	44,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Bromodichloromethane	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Bromoform	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Carbon disulfide	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Carbon tetrachloride	UG/KG	0	22,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chlorobenzene	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chlorodibromomethane	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chloroethane	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chloroform	UG/KG	0	350,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Cis-1,3-Dichloropropene	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Ethyl benzene	UG/KG	0	390,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl bromide	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl butyl ketone	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl chloride	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl ethyl ketone	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl isobutyl ketone	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methylene chloride	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Styrene	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Tetrachloroethene	UG/KG	19	150,000	0	6	16	12 U	4 J	6 J	8 J	19	2 J	3 J
Toluene	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Total Xylenes	UG/KG	0	500,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Trans-1,3-Dichloropropene	UG/KG	0			0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Trichloroethene	UG/KG	0	200,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Vinyl chloride	UG/KG	0	13,000	0	0	16	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Semivolatile Organic Compounds													
1,2,4-Trichlorobenzene	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
1,2-Dichlorobenzene	UG/KG	0	500,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
1,3-Dichlorobenzene	UG/KG	0	280,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
1,4-Dichlorobenzene	UG/KG	0	130,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0			0	16	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4,5-Trichlorophenol	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
2,4,6-Trichlorophenol	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4-Dichlorophenol	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4-Dimethylphenol	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4-Dinitrophenol	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
2,4-Dinitrotoluene	UG/KG	14,000			13	35	390 U	100 J	190 J	14,000	84 J	59 J	230 J
2,6-Dinitrotoluene	UG/KG	700			2	35	390 U	370 U	360 U	700 J	400 U	460 U	370 U
2-Chloronaphthalene	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Chlorophenol	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Methylnaphthalene	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Methylphenol	UG/KG	0	500,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Nitroaniline	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
2-Nitrophenol	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
3 or 4-Methylphenol	UG/KG	0			0	19							
3,3'-Dichlorobenzidine	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
3-Nitroaniline	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
4,6-Dinitro-2-methylphenol	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
4-Bromophenyl phenyl ether	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Chloro-3-methylphenol	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Chloroaniline	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Chlorophenyl phenyl ether	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Methylphenol	UG/KG	0	500,000	0	0	16	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Nitroaniline	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
4-Nitrophenol	UG/KG	0			0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
Acenaphthene	UG/KG	0	500,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Acenaphthylene	UG/KG	30	500,000	0	3	35	390 U	19 J	17 J	1,900 U	400 U	460 U	370 U
Anthracene	UG/KG	18	500,000	0	2	35	390 U	17 J	360 U	1,900 U	400 U	460 U	370 U
Benzo(a)anthracene	UG/KG	50	5,600	0	8	35	390 U	32 J	30 J	1,900 U	22 J	36 J	32 J
Benzo(a)pyrene	UG/KG	82	1,000	0	8	35	390 U	46 J	41 J	1,900 U	28 J	45 J	42 J
Benzo(b)fluoranthene	UG/KG	55	5,600	0	9	35	20 J	38 J	36 J	1,900 U	24 J	39 J	42 J
Benzo(ghi)perylene	UG/KG	66	500,000	0	7	35	390 U	66 J	58 J	1,900 U	34 J	53 J	45 J
Benzo(k)fluoranthene	UG/KG	58	56,000	0	7	35	390 U	28 J	26 J	1,900 U	21 J	34 J	23 J

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SS45-9	TP45-1	TP45-1	TP45-2	TP45-3	TP45-4	TP45-5
Sample ID							SS45-9	TP45-1	TP45-11	TP45-2	TP45-3	TP45-4	TP45-5
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0-0.2	3-3	3-3	3-3	3-3	3-3	3-3
Sample Date							10/25/1993	11/11/1993	11/11/1993	11/11/1993	11/11/1993	11/9/1993	11/9/1993
QC Type							SA	SA	DU	SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI	ESI	ESI	ESI
Bis(2-Chloroethoxy)methane	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Bis(2-Chloroethyl)ether	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Bis(2-Chloroisopropyl)ether	UG/KG	0			0	19							
Bis(2-Ethylhexyl)phthalate	UG/KG	740			9	35	350 J	65 J	50 J	1,900 U	400 U	460 U	370 U
Butylbenzylphthalate	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Carbazole	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Chrysene	UG/KG	130	56,000	0	12	35	27 J	46 J	44 J	1,900 U	37 J	51 J	47 J
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Dibenzofuran	UG/KG	0	350,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Diethyl phthalate	UG/KG	35			1	35	390 U	370 U	360 U	1,900 U	400 U	35 J	370 U
Dimethylphthalate	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Di-n-butylphthalate	UG/KG	6,800			12	35	390 U	35 J	170 J	6,800	27 J	75 J	230 J
Di-n-octylphthalate	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Fluoranthene	UG/KG	68	500,000	0	11	35	30 J	59 J	50 J	1,900 U	52 J	68 J	58 J
Fluorene	UG/KG	0	500,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Hexachlorobenzene	UG/KG	110	6,000	0	11	35	30 J	62 J	54 J	1,900 U	52 J	48 J	42 J
Hexachlorobutadiene	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Hexachlorocyclopentadiene	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Hexachloroethane	UG/KG	1,100			6	35	390 U	72 J	68 J	1,900 U	1,100	41 J	36 J
Indeno(1,2,3-cd)pyrene	UG/KG	52	5,600	0	4	35	390 U	37 J	360 U	1,900 U	400 U	29 J	26 J
Isophorone	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Naphthalene	UG/KG	30	500,000	0	5	35	390 U	30 J	27 J	1,900 U	24 J	30 J	370 U
Nitrobenzene	UG/KG	0			0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
N-Nitrosodiphenylamine	UG/KG	320			2	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
N-Nitrosodipropylamine	UG/KG	1,600			5	35	390 U	370 U	30 J	1,600 J	20 J	460 U	25 J
Pentachlorophenol	UG/KG	0	6,700	0	0	35	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
Phenanthrene	UG/KG	46	500,000	0	9	35	18 J	46 J	38 J	1,900 U	38 J	44 J	34 J
Phenol	UG/KG	0	500,000	0	0	35	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Pyrene	UG/KG	110	500,000	0	12	35	36 J	110 J	98 J	100 J	90 J	110 J	97 J
Herbicides													
2,4,5-T	UG/KG	0			0	35	5.9 U	5.6 U	5.5 U	5.8 U	6 U	6.9 U	5.6 U
2,4,5-TP/Silvex	UG/KG	0	500,000	0	0	35	5.9 U	5.6 U	5.5 U	5.8 U	6 U	6.9 U	5.6 U
2,4-D	UG/KG	0			0	35	59 U	56 U	55 U	58 U	60 U	69 U	56 U
2,4-DB	UG/KG	0			0	35	59 U	56 U	55 U	58 U	60 U	69 U	56 U
Dalapon	UG/KG	0			0	35	150 U	140 U	140 U	140 U	150 U	170 U	140 U
Dicamba	UG/KG	0			0	35	5.9 U	5.6 U	5.5 U	5.8 U	6 U	6.9 U	5.6 U
Dichloroprop	UG/KG	0			0	35	59 U	56 U	55 U	58 U	60 U	69 U	56 U
Dinoseb	UG/KG	0			0	35	30 U	28 U	28 U	29 U	30 U	35 U	28 U
MCPA	UG/KG	9,400			2	35	5,900 U	5,600 U	5,500 U	5,800 U	6,000 U	6,900 U	5,600 U
MCPP	UG/KG	0			0	35	5,900 U	5,600 U	5,500 U	5,800 U	6,000 U	6,900 U	5,600 U
Explosives													
1,3,5-Trinitrobenzene	UG/KG	190			28	47	130 UJ	150 J	170 J	190 J	130 UJ	180	140
1,3-Dinitrobenzene	UG/KG	0			0	47	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 U	130 U
2,4,6-Trinitrotoluene	UG/KG	1,400			38	47	1,400 J	330 J	340 J	600 J	400 J	330	280
2,4-Dinitrotoluene	UG/KG	1,100			36	47	130 UJ	130 UJ	140 J	190 J	120 J	110 J	90 J
2,6-Dinitrotoluene	UG/KG	0			0	47	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 U	130 U
2-amino-4,6-Dinitrotoluene	UG/KG	680			36	47	130 UJ	430 J	430 J	680 J	530 J	480	350
2-Nitrotoluene	UG/KG	0			0	31							
3,5-Dinitroaniline	UG/KG	0			0	31							
3-Nitrotoluene	UG/KG	0			0	31							
4-amino-2,6-Dinitrotoluene	UG/KG	500			27	47	270 J	130 UJ	130 UJ	130 UJ	130 UJ	130 U	130 U
4-Nitrotoluene	UG/KG	0			0	31							
HMX	UG/KG	470			32	47	130 UJ	250 J	430 J	470 J	240 J	350	200
Nitrobenzene	UG/KG	0			0	31							
Nitroglycerine	UG/KG	1,500			1	31							
Pentaerythritol Tetranitrate	UG/KG	0			0	31							
RDX	UG/KG	5,800			39	47	5,800 J	2,500 J	1,600 J	2,700 J	2,500 J	4,300	1,300
Tetryl	UG/KG	330			4	47	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 U	180 J

Table A-1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SS45-9	TP45-1	TP45-1	TP45-2	TP45-3	TP45-4	TP45-5
Sample ID							SS45-9	TP45-1	TP45-11	TP45-2	TP45-3	TP45-4	TP45-5
Matrix							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)							0-0.2	3-3	3-3	3-3	3-3	3-3	3-3
Sample Date							10/25/1993	11/11/1993	11/11/1993	11/11/1993	11/11/1993	11/9/1993	11/9/1993
QC Type							SA	SA	DU	SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs													
Aroclor-1016	UG/KG	0	1,000	0	0	34	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1221	UG/KG	0	1,000	0	0	34	78 UR	74 U	74 U	77 U	81 U	93 U	75 U
Aroclor-1232	UG/KG	0	1,000	0	0	34	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1242	UG/KG	0	1,000	0	0	34	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1248	UG/KG	0	1,000	0	0	34	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1254	UG/KG	2,000	1,000	1	2	34	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1260	UG/KG	0	1,000	0	0	34	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
4,4'-DDD	UG/KG	2.4	92,000	0	2	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
4,4'-DDE	UG/KG	4.2	62,000	0	22	35	3.3 J	3.7 U	3.6 U	3.8 U	4 U	3.2 J	1.9 J
4,4'-DDT	UG/KG	3.4	47,000	0	17	34	3.8 UR	3.7 U	2.3 J	3.8 U	2.9 J	4.6 U	3.7 U
Aldrin	UG/KG	0	680	0	0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Alpha-BHC	UG/KG	0	3,400	0	0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Alpha-Chlordane	UG/KG	2	24,000	0	4	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Beta-BHC	UG/KG	0	3,000	0	0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Delta-BHC	UG/KG	0	500,000	0	0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Dieldrin	UG/KG	3.2	1,400	0	14	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	2.4 J	3.7 U
Endosulfan I	UG/KG	55	200,000	0	21	35	1 J	1.9 J	2.2 J	1.9 J	1.6 J	2.4 U	1.9 U
Endosulfan II	UG/KG	0.88	200,000	0	1	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endosulfan sulfate	UG/KG	0	200,000	0	0	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endrin	UG/KG	3.6	89,000	0	1	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endrin aldehyde	UG/KG	0			0	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endrin ketone	UG/KG	0.58			1	34	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Gamma-BHC/Lindane	UG/KG	0	9,200	0	0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Gamma-Chlordane	UG/KG	1.1			3	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Heptachlor	UG/KG	0	15,000	0	0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Heptachlor epoxide	UG/KG	0			0	34	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Methoxychlor	UG/KG	45			1	34	20 UR	19 U	19 U	20 U	20 U	24 U	19 U
Toxaphene	UG/KG	0			0	34	200 UR	190 U	190 U	200 U	200 U	240 U	190 U
Inorganics													
Aluminum	MG/KG	27,900			97	97	17,800	20,100	16,500	20,800	22,800	20,600	17,300
Antimony	MG/KG	5.1			32	97	9.4 UJ	9.7 UJ	7.6 UJ	12.1 UJ	12.4 UJ	10.2 U	9.2 U
Arsenic	MG/KG	12.6	16	0	97	97	6.1	6.8	6.3	7.1	8.2	6 J	5.1 J
Barium	MG/KG	365	400	0	97	97	202	208	177	201	248	216	174
Beryllium	MG/KG	1.2	590	0	95	97	0.79 J	0.9 J	0.8	0.91 J	1.1 J	0.94 J	0.8 J
Cadmium	MG/KG	1,100	9.3	11	77	95	5.5 J	**10.4 J**	**9.6 J**	**9.5 J**	**13.1 J**	10.9 UR	7.4 UR
Calcium	MG/KG	193,000			96	97	22,600	42,700	31,500	26,400	32,500	36,400	32,100
Chromium	MG/KG	446	1,500	0	97	97	27.4	31.3	25.7	30.1	35.5	32.1	27.6
Cobalt	MG/KG	26.8			97	97	15	13.2	13.2	12.8	16.9	15.3	12.1
Copper	MG/KG	7,310	270	52	97	97	267	**722**	**555**	**561**	**791**	**1,240 J**	**449 J**
Cyanide	MG/KG	0.7	27	0	2	16	0.7 U	0.7	0.54 U	0.55 U	0.55 U	0.62	0.51 U
Iron	MG/KG	118,000			97	97	32,500	35,700	31,900	31,500	41,300	37,600	31,600
Lead	MG/KG	998	1,000	0	97	97	77.7	54.1	73.3	69.4	87.8	74.7	61.9
Magnesium	MG/KG	15,000			97	97	7,110	7,910	7,780	7,800	9,270	8,940	7,570
Manganese	MG/KG	5,040	10,000	0	97	97	912	1,380	613	605	827	726	600
Nickel	MG/KG	59.3	310	0	92	92	42.5	41.8	39.1	40.5	51	48.3	39.2
Potassium	MG/KG	4,880			76	76	2,260	3,040	1,960	3,280	3,010	2,400	1,960
Selenium	MG/KG	0.92	1,500	0	4	97	0.24 UJ	0.23 UJ	0.15 UJ	0.16 UJ	0.23 UJ	0.27 UJ	0.2 UJ
Silver	MG/KG	205	1,500	0	66	97	1.3 J	3.2 J	4.7 J	5 J	6.6 J	26.2 J	3.9 J
Sodium	MG/KG	213			81	97	93.4 J	141 J	105 J	116 J	135 J	136 J	122 J
Thallium	MG/KG	0.27			6	97	0.26 U	0.25 U	0.16 U	0.17 U	0.25 U	0.29 UJ	0.22 UJ
Vanadium	MG/KG	41.9			97	97	28.9	32.4	26.7	34.4	38	32.6	27.3
Zinc	MG/KG	1,470	10,000	0	92	92	383	345	360	390	538	557 J	333 J
Mercury	MG/KG	9.1	2.8	49	96	97	1.9 J	**3.1 J**	1.4 J	**3.1 J**	**4 J**	**3.6**	**4.3**

Notes:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value.
R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A-2
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area								SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID								MW1	MW2	MW3	MW4	MW45-2	MW45-3	MW45-4	MW45-4	MW45-4	MW45-4	MW45-4	MW5
Sample ID								MW1	MW2	MW3	MW4	MW45-2	MW45-3	122000	122247	122248	MW45-4	OB108	MW5
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample Date								2/1/1994	2/2/1994	2/1/1994	2/2/1994	2/3/1994	2/3/1994	4/9/1999	12/7/1999	12/7/1999	1/26/1994	6/18/1997	2/2/1994
QC Type								SA	SA	SA	SA	SA	SA	SA	SA	DU	SA	SA	SA
Study ID								ESI	ESI	ESI	ESI	ESI	ESI	RI	RI	RI	ESI	OB_Quarterly	ESI
														1	2	2		0	
								N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Unit	Maximum Value	Criteria Source	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds																			
1,1,1-Trichloroethane	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,1,2,2-Tetrachloroethane	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,1,2-Trichloroethane	µG/L	0	GA	1	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,1-Dichloroethane	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,1-Dichloroethene	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,2-Dichloroethane	µG/L	0	GA	0.6	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,2-Dichloroethene (total)	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
1,2-Dichloropropane	µG/L	0	GA	1	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Acetone	µG/L	0				0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Benzene	µG/L	0	GA	1	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Bromodichloromethane	µG/L	0	MCL	80	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Bromoform	µG/L	0	MCL	80	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Carbon disulfide	µG/L	0				0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Carbon tetrachloride	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Chlorobenzene	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Chlorodibromomethane	µG/L	0	MCL	80	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Chloroethane	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Chloroform	µG/L	0	GA	7	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Cis-1,3-Dichloropropene	µG/L	0	GA	0.4	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Ethyl benzene	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Methyl bromide	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Methyl butyl ketone	µG/L	0				0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Methyl chloride	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Methyl ethyl ketone	µG/L	0				0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Methyl isobutyl ketone	µG/L	0				0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Methylene chloride	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Styrene	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Tetrachloroethene	µG/L	1	GA	5	0	1	8	1 J	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Toluene	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Total Xylenes	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Trans-1,3-Dichloropropene	µG/L	0	GA	0.4	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Trichloroethene	µG/L	0	GA	5	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Vinyl chloride	µG/L	0	GA	2	0	0	8	10 U	10 U	10 U	10 U	10 U	10 U				10 U		10 U
Semivolatile Organic Compounds																			
1,2,4-Trichlorobenzene	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
1,2-Dichlorobenzene	µG/L	0	GA	3	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
1,3-Dichlorobenzene	µG/L	0	GA	3	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
1,4-Dichlorobenzene	µG/L	0	GA	3	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2,2'-oxybis(1-Chloropropane)	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2,4,5-Trichlorophenol	µG/L	0	GA	1	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
2,4,6-Trichlorophenol	µG/L	0	GA	1	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2,4-Dichlorophenol	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2,4-Dimethylphenol	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2,4-Dinitrophenol	µG/L	0				0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
2,4-Dinitrotoluene	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2,6-Dinitrotoluene	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2-Chloronaphthalene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2-Chlorophenol	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2-Methylnaphthalene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2-Methylphenol	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
2-Nitroaniline	µG/L	0	GA	5	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
2-Nitrophenol	µG/L	0	GA	1	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
3,3'-Dichlorobenzidine	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
3-Nitroaniline	µG/L	0	GA	5	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
4,6-Dinitro-2-methylphenol	µG/L	0	GA	1	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
4-Bromophenyl phenyl ether	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
4-Chloro-3-methylphenol	µG/L	0	GA	1	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
4-Chloroaniline	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
4-Chlorophenyl phenyl ether	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
4-Methylphenol	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
4-Nitroaniline	µG/L	0	GA	5	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
4-Nitrophenol	µG/L	0	GA	1	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
Acenaphthene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Acenaphthylene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Anthracene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U

Table A-2
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area								SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID								MW1	MW2	MW3	MW4	MW45-2	MW45-3	MW45-4	MW45-4	MW45-4	MW45-4	MW45-4	MW5
Sample ID								MW1	MW2	MW3	MW4	MW45-2	MW45-3	122000	122247	122248	MW45-4	OB108	MW5
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample Date								2/1/1994	2/2/1994	2/1/1994	2/2/1994	2/3/1994	2/3/1994	4/9/1999	12/7/1999	12/7/1999	1/26/1994	6/18/1997	2/2/1994
QC Type								SA	SA	SA	SA	SA	SA	SA	SA	DU	SA	SA	SA
Study ID								ESI	ESI	ESI	ESI	ESI	ESI	RI	RI	RI	ESI	OB_Quarterly	ESI
														1	2	2		0	
					Number	Number	Number	N	N	N	N	N	N	N	N	N	N	N	N
		Maximum	Criteria	Criteria	of	of Times	of Samples												
Parameter	Unit	Value	Source	Value	Exceedances	Detected	Analyzed	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Benzo(a)anthracene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Benzo(a)pyrene	µG/L	0	GA	0		0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Benzo(b)fluoranthene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Benzo(ghi)perylene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Benzo(k)fluoranthene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Bis(2-Chloroethoxy)methane	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Bis(2-Chloroethyl)ether	µG/L	0	GA	1	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Bis(2-Ethylhexyl)phthalate	µG/L	33	GA	5	4	4	8	**33**	11 U	**12**	**11**	**23**	11 U				11 U		10 U
Butylbenzylphthalate	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Carbazole	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Chrysene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Dibenz(a,h)anthracene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Dibenzofuran	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Diethyl phthalate	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Dimethylphthalate	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Di-n-butylphthalate	µG/L	0	GA	50	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Di-n-octylphthalate	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Fluoranthene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Fluorene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Hexachlorobenzene	µG/L	0	GA	0.04	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Hexachlorobutadiene	µG/L	0	GA	0.5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Hexachlorocyclopentadiene	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Hexachloroethane	µG/L	0	GA	5	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Indeno(1,2,3-cd)pyrene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Isophorone	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Naphthalene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Nitrobenzene	µG/L	0	GA	0.4	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
N-Nitroso-di-n-propylamine	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
N-Nitrosodiphenylamine	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Pentachlorophenol	µG/L	0	GA	1	0	0	8	25 U	28 U	25 U	26 U	27 U	27 U				27 U		26 U
Phenanthrene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Phenol	µG/L	0	GA	1	0	0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Pyrene	µG/L	0				0	8	10 U	11 U	10 U	10 U	11 U	11 U				11 U		10 U
Herbicides																			
2,4,5-T	µG/L	0	GA	35	0	0	8	0.11 U	0.12 U	0.11 U	0.12 U	0.11 U	0.11 U				0.11 U		0.11 U
2,4,5-TP/Silvex	µG/L	0	GA	0.26	0	0	8	0.11 U	0.12 U	0.11 U	0.12 U	0.11 U	0.11 U				0.11 U		0.11 U
2,4-D	µG/L	0	GA	50	0	0	8	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U				1.1 U		1.1 U
2,4-DB	µG/L	0				0	8	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U				1.1 U		1.1 U
Dalapon	µG/L	0	GA	50	0	0	8	2.5 U	2.7 U	2.4 U	2.7 U	2.5 U	2.5 U				2.5 U		2.5 U
Dicamba	µG/L	0	GA	0.44	0	0	8	0.11 U	0.12 U	0.11 U	0.12 U	0.11 U	0.11 U				0.11 U		0.11 U
Dichloroprop	µG/L	0				0	8	1.1 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U				1.1 U		1.1 U
Dinoseb	µG/L	0	GA	1	0	0	8	0.53 U	0.58 U	0.52 U	0.59 U	0.54 U	0.53 U				0.54 U		0.55 U
MCPA	µG/L	0	GA	0.44	0	0	8	110 U	120 U	110 U	120 U	110 U	110 U				110 U		110 U
MCPP	µG/L	0				0	8	110 U	120 U	110 U	120 U	110 U	110 U				110 U		110 U
Explosives																			
1,3,5-Trinitrobenzene	µG/L	0	GA	5	0	0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
1,3-Dinitrobenzene	µG/L	0.067	GA	5	0	1	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.067 J
2,4,6-Trinitrotoluene	µG/L	0				0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
2,4-Dinitrotoluene	µG/L	0	GA	5	0	0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
2,6-Dinitrotoluene	µG/L	0	GA	5	0	0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
2-amino-4,6-Dinitrotoluene	µG/L	0				0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
4-amino-2,6-Dinitrotoluene	µG/L	0				0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
HMX	µG/L	0.5				1	8	0.5	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
RDX	µG/L	0				0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
Tetryl	µG/L	0				0	8	0.13 U	0.13 U	0.13 U	0.13 U	0.13 UJ	0.13 U				0.13 U		0.13 U
Pesticides/PCBs																			
4,4'-DDD	µG/L	0	GA	0.3	0	0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
4,4'-DDE	µG/L	0	GA	0.2	0	0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
4,4'-DDT	µG/L	0	GA	0.2	0	0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Aldrin	µG/L	0	GA	0		0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Alpha-BHC	µG/L	0	GA	0.01	0	0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Alpha-Chlordane	µG/L	0				0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Aroclor-1016	µG/L	0	GA	0.09	0	0	8	1.4 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U				1.1 UJ		1.1 U
Aroclor-1221	µG/L	0	GA	0.09	0	0	8	2.7 U	2.3 U	2.1 U	2.4 U	2.2 U	2.4 U				2.2 UJ		2.2 U

Table A-2
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Source	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed												
Area								SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID								MW1	MW2	MW3	MW4	MW45-2	MW45-3	MW45-4	MW45-4	MW45-4	MW45-4	MW45-4	MW5
Sample ID								MW1	MW2	MW3	MW4	MW45-2	MW45-3	122000	122247	122248	MW45-4	OB108	MW5
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample Date								2/1/1994	2/2/1994	2/1/1994	2/2/1994	2/3/1994	2/3/1994	4/9/1999	12/7/1999	12/7/1999	1/26/1994	6/18/1997	2/2/1994
QC Type								SA	SA	SA	SA	SA	SA	SA	SA	DU	SA	SA	SA
Study ID								ESI	ESI	ESI	ESI	ESI	ESI	RI	RI	RI	ESI	OB_Quarterly	ESI
														1	2	2		0	
								N	N	N	N	N	N	N	N	N	N	N	N
								Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Aroclor-1232	µG/L	0	GA	0.09	0	0	8	1.4 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U				1.1 UJ		1.1 U
Aroclor-1242	µG/L	0	GA	0.09	0	0	8	1.4 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U				1.1 UJ		1.1 U
Aroclor-1248	µG/L	0	GA	0.09	0	0	8	1.4 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U				1.1 UJ		1.1 U
Aroclor-1254	µG/L	0	GA	0.09	0	0	8	1.4 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U				1.1 UJ		1.1 U
Aroclor-1260	µG/L	0	GA	0.09	0	0	8	1.4 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U				1.1 UJ		1.1 U
Beta-BHC	µG/L	0	GA	0.04	0	0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Delta-BHC	µG/L	0	GA	0.04	0	0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Dieldrin	µG/L	0	GA	0.004	0	0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Endosulfan I	µG/L	0				0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Endosulfan II	µG/L	0				0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Endosulfan sulfate	µG/L	0				0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Endrin	µG/L	0	GA	0		0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Endrin aldehyde	µG/L	0	GA	5	0	0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Endrin ketone	µG/L	0	GA	5	0	0	8	0.14 U	0.11 U	0.1 U	0.12 U	0.11 U	0.12 U				0.11 UJ		0.11 U
Gamma-BHC/Lindane	µG/L	0	GA	0.05	0	0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Gamma-Chlordane	µG/L	0				0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Heptachlor	µG/L	0	GA	0.04	0	0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Heptachlor epoxide	µG/L	0	GA	0.03	0	0	8	0.068 U	0.057 U	0.052 U	0.059 U	0.056 U	0.059 U				0.056 UJ		0.054 U
Methoxychlor	µG/L	0	GA	35	0	0	8	0.68 U	0.57 U	0.52 U	0.59 U	0.56 U	0.59 U				0.56 UJ		0.54 U
Toxaphene	µG/L	0	GA	0.06	0	0	8	6.8 U	5.7 U	5.2 U	5.9 U	5.6 U	5.9 U				5.6 UJ		5.4 U
Inorganics																			
Aluminum	µG/L	63,300				9	12	124 J	828	83.5 J	17,700	42 U	7,510	215	14.3 U	14.3 U	63,300	36.8	821
Antimony	µG/L	52.1	GA	3	7	7	12	**24.3 J**	**23.1 J**	**52.1 J**	**49.6 J**	**26.8 J**	**36.7 J**	2.2 U	2.7 U	2.7 U	21.6 UJ	2.8 U	**28.1 J**
Arsenic	µG/L	9.5	MCL	10	0	3	12	1.4 U	1.4 U	1.4 U	1.7 J	1.4 U	1.8 J	1.8 U	1.9 U	1.9 U	9.5 J	3.6 U	1.4 U
Barium	µG/L	751	GA	1,000	0	12	12	56.5 J	50.8 J	25.5 J	195 J	27.2 J	62.1 J	24.4 J	28.2 J	28.4 J	751	23.4	82.8 J
Beryllium	µG/L	5	MCL	4	1	3	12	0.4 U	0.4 U	0.4 U	0.87 J	0.4 U	0.52 J	0.1 U	0.2 U	0.2 U	**5**	2 U	0.4 U
Cadmium	µG/L	3.8	GA	5	0	4	12	2.2 J	2.1 U	2.1 U	3.8 J	2.9 J	3.2 J	0.3 U	0.3 U	0.3 U	2.1 U	4 U	2.1 U
Calcium	µG/L	660,000				12	12	118,000	94,600	91,700	152,000	232,000	211,000	144,000	177,000	181,000	660,000	112,000	123,000
Chromium	µG/L	106	GA	50	1	5	12	2.6 U	4.1 J	2.6 U	28.9	2.6 U	16.1	0.7 U	0.9 U	0.9 U	**106**	1.3 U	2.6 J
Cobalt	µG/L	94.4				4	12	4.4 U	5.3 J	4.4 U	11 J	4.4 U	14.6 J	1.5 U	2 U	2 U	94.4	1.4 U	4.4 U
Copper	µG/L	123	GA	200	0	7	12	3.1 U	7.2 J	3.9 J	79.2	3.1 U	11.9 J	1 U	1.9 J	1.7 U	123	1.5	3.1 U
Cyanide	µG/L	0				0	11	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 UJ	10 UJ	5 U		5 U
Iron	µG/L	113,000	GA	300	5	10	12	207	**940**	109	**27,500**	48.5 J	**14,100**	256	25.4 U	25.4 U	**113,000**	62.8	**1,220**
Iron+Manganese	µG/L	117,640	GA	500	6	12	12	211.4 J	**963.7**	111.9 J	**27,884**	**1,449 J**	**14,725**	263.1 J	13.8 J	13.7 J	**117,640**	67.8 J	**1,275**
Lead	µG/L	75.6	MCL	15	2	8	12	0.71 J	0.66 J	0.73 J	**15.7**	0.71 J	9.5	0.9 U	1 U	1 U	**75.6**	2 U	1.1 J
Magnesium	µG/L	77,900				12	12	26,400	15,700	15,800	31,600	57,800	77,900	31,400	36,500	37,400	73,500	24,200	27,700
Manganese	µG/L	4,640	GA	300	4	12	12	4.4 J	23.7	2.9 J	**384**	**1,400**	**625**	7.1 J	1.1 J	1 J	**4,640**	5 J	55
Mercury	µG/L	1.8	GA	0.7	1	3	12	0.04 U	0.04 U	0.04 U	**1.8**	0.04 U	0.08 J	0.1 UJ	0.1 UJ	0.1 UJ	0.29	0.2 U	0.04 U
Nickel	µG/L	209	GA	100	1	5	12	4 U	4 U	4 U	43.9	10.2 J	30.7 J	1.4 U	1.7 U	1.7 U	**209**	2.2	4 U
Potassium	µG/L	18,700				9	12	910 U	1,050 J	904 U	6,540	9,660	18,700	2,460 J	2,660 J	2,870 J	13,900	2,180	907 U
Selenium	µG/L	2.5	GA	10	0	5	12	0.99 J	0.7 U	0.7 U	1.9 J	2.5 J	1.9 J	1.8 U	2.4 UJ	2.4 UJ	0.7 U	3.1 U	1.5 J
Silver	µG/L	4.6	GA	50	0	2	12	4.2 U	4.2 U	4.2 U	4.6 J	4.2 U	4.2 U	0.9 U	1.9 UJ	1.9 UJ	4.2 U	0.98	4.2 U
Sodium	µG/L	40,000	GA	20,000	1	12	12	10,000	13,100	3,400 J	15,800	**40,000**	18,600	11,400	14,000	13,900	17,300	10,600	16,100
Thallium	µG/L	3.4	MCL	2	1	1	12	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	**3.4 J**	2.7 U	2.7 U	1.2 U	4 U	1.2 U
Vanadium	µG/L	93.1				3	12	3.7 U	3.7 U	3.7 U	29.7 J	3.7 U	11.7 J	1.6 U	1.5 U	1.5 U	93.1	1.2 U	3.7 U
Zinc	µG/L	321				12	12	15.3 J	23	14 J	164	31.6	81.1	5.8 J	5.1 J	5.3 J	321	6.8	24.5

Footnote:
1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value. J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value. R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
- The NYS GA Standard and EPA MCL values were obtained from the provided links.
http://www.dec.ny.gov/regulations/2652.html
http://water.epa.gov/drink/contaminants/index.cfm#List

Table A-3
Analytical Results For Surface Water Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area							SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID							SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Sample ID							SW45-1		SW45-2		SW45-3		SW45-4	
Matrix							SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
Sample Depth Interval (Ft)							0-0.1		0-0.1		0-0.1		0-0.1	
Sample Date							11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type							SA		SA		SA		SA	
Study ID							ESI		ESI		ESI		ESI	
Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Volatile Organic Compounds														
1,1,1-Trichloroethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,1-Dichloroethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,1-Dichloroethene	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,2-Dichloroethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	µG/L	0			0	4	10	U	10	U	10	U	10	U
1,2-Dichloropropane	µG/L	0			0	4	10	U	10	U	10	U	10	U
Acetone	µG/L	0			0	4	10	U	10	U	10	U	10	U
Benzene	µG/L	0			0	4	10	U	10	U	10	U	10	U
Bromodichloromethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
Bromoform	µG/L	0			0	4	10	U	10	U	10	U	10	U
Carbon disulfide	µG/L	0			0	4	10	U	10	U	10	U	10	U
Carbon tetrachloride	µG/L	0			0	4	10	U	10	U	10	U	10	U
Chlorobenzene	µG/L	0	5	0	0	4	10	U	10	U	10	U	10	U
Chlorodibromomethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
Chloroethane	µG/L	0			0	4	10	U	10	U	10	U	10	U
Chloroform	µG/L	0			0	4	10	U	10	U	10	U	10	U
Cis-1,3-Dichloropropene	µG/L	0			0	4	10	U	10	U	10	U	10	U
Ethyl benzene	µG/L	0			0	4	10	U	10	U	10	U	10	U
Methyl bromide	µG/L	0			0	4	10	U	10	U	10	U	10	U
Methyl butyl ketone	µG/L	0			0	4	10	U	10	U	10	U	10	U
Methyl chloride	µG/L	0			0	4	10	U	10	U	10	U	10	U
Methyl ethyl ketone	µG/L	0			0	4	10	U	10	U	10	U	10	U
Methyl isobutyl ketone	µG/L	0			0	4	10	U	10	U	10	U	10	U
Methylene chloride	µG/L	0			0	4	10	U	10	U	10	U	10	U
Styrene	µG/L	0			0	4	10	U	10	U	10	U	10	U
Tetrachloroethene	µG/L	0			0	4	10	U	10	U	10	U	10	U
Toluene	µG/L	0	6,000	0	0	4	10	U	10	U	10	U	10	U
Total Xylenes	µG/L	0			0	4	10	U	10	U	10	U	10	U
Trans-1,3-Dichloropropene	µG/L	0			0	4	10	U	10	U	10	U	10	U
Trichloroethene	µG/L	0	40	0	0	4	10	U	10	U	10	U	10	U
Vinyl chloride	µG/L	0			0	4	10	U	10	U	10	U	10	U
Semivolatile Organic Compounds														
1,2,4-Trichlorobenzene	µG/L	0	5	0	0	4	10	U	11	U	11	U	10	U
1,2-Dichlorobenzene	µG/L	0	5	0	0	4	10	U	11	U	11	U	10	U
1,3-Dichlorobenzene	µG/L	0	5	0	0	4	10	U	11	U	11	U	10	U
1,4-Dichlorobenzene	µG/L	0	5	0	0	4	10	U	11	U	11	U	10	U
2,2'-oxybis(1-Chloropropane)	µG/L	0			0	4	10	U	11	U	11	U	10	U
2,4,5-Trichlorophenol	µG/L	0			0	4	26	U	27	U	26	U	25	U
2,4,6-Trichlorophenol	µG/L	0			0	4	10	U	11	U	11	U	10	U
2,4-Dichlorophenol	µG/L	0	1	0	0	4	10	U	11	U	11	U	10	U
2,4-Dimethylphenol	µG/L	0	1,000	0	0	4	10	U	11	U	11	U	10	U
2,4-Dinitrophenol	µG/L	0	400	0	0	4	26	U	27	U	26	U	25	U
2,4-Dinitrotoluene	µG/L	0			0	4	10	U	11	U	11	U	10	U
2,6-Dinitrotoluene	µG/L	0			0	4	10	U	11	U	11	U	10	U
2-Chloronaphthalene	µG/L	0			0	4	10	U	11	U	11	U	10	U
2-Chlorophenol	µG/L	0			0	4	10	U	11	U	11	U	10	U
2-Methylnaphthalene	µG/L	0	4.7	0	0	4	10	U	11	U	11	U	10	U
2-Methylphenol	µG/L	0			0	4	10	U	11	U	11	U	10	U
2-Nitroaniline	µG/L	0			0	4	26	U	27	U	26	U	25	U
2-Nitrophenol	µG/L	0			0	4	10	U	11	U	11	U	10	U
3,3'-Dichlorobenzidine	µG/L	0			0	4	10	U	11	U	11	U	10	U
3-Nitroaniline	µG/L	0			0	4	26	U	27	U	26	U	25	U
4,6-Dinitro-2-methylphenol	µG/L	0			0	4	26	U	27	U	26	U	25	U
4-Bromophenyl phenyl ether	µG/L	0			0	4	10	U	11	U	11	U	10	U
4-Chloro-3-methylphenol	µG/L	0			0	4	10	U	11	U	11	U	10	U
4-Chloroaniline	µG/L	0			0	4	10	U	11	U	11	U	10	U
4-Chlorophenyl phenyl ether	µG/L	0			0	4	10	U	11	U	11	U	10	U
4-Methylphenol	µG/L	0			0	4	10	U	11	U	11	U	10	U
4-Nitroaniline	µG/L	0			0	4	26	U	27	U	26	U	25	U
4-Nitrophenol	µG/L	0			0	4	26	U	27	U	26	U	25	U
Acenaphthene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Acenaphthylene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Anthracene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Benzo(a)anthracene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Benzo(a)pyrene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Benzo(b)fluoranthene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Benzo(ghi)perylene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Benzo(k)fluoranthene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Bis(2-Chloroethoxy)methane	µG/L	0			0	4	10	U	11	U	11	U	10	U
Bis(2-Chloroethyl)ether	µG/L	0			0	4	10	U	11	U	11	U	10	U
Bis(2-Ethylhexyl)phthalate	µG/L	0	0.6	0	0	4	10	U	11	U	11	U	10	U
Butylbenzylphthalate	µG/L	0			0	4	10	U	11	U	11	U	10	U
Carbazole	µG/L	0			0	4	10	U	11	U	11	U	10	U
Chrysene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Dibenz(a,h)anthracene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Dibenzofuran	µG/L	0			0	4	10	U	11	U	11	U	10	U
Diethyl phthalate	µG/L	0			0	4	10	U	11	U	11	U	10	U
Dimethylphthalate	µG/L	0			0	4	10	U	11	U	11	U	10	U
Di-n-butylphthalate	µG/L	0			0	4	10	U	11	U	11	U	10	U
Di-n-octylphthalate	µG/L	0			0	4	10	U	11	U	11	U	10	U
Fluoranthene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Fluorene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Hexachlorobenzene	µG/L	0	0.00003	0	0	4	10	U	11	U	11	U	10	U
Hexachlorobutadiene	µG/L	0	0.01	0	0	4	10	U	11	U	11	U	10	U
Hexachlorocyclopentadiene	µG/L	0	0.45	0	0	4	10	U	11	U	11	U	10	U
Hexachloroethane	µG/L	0	0.6	0	0	4	10	U	11	U	11	U	10	U

Table A-3
Analytical Results For Surface Water Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Parameter	Unit	Maximum Value	Criteria Value	Number of Exceedances	Number of Times Detected	Number of Samples Analyzed	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Area							SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID							SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Sample ID							SW45-1		SW45-2		SW45-3		SW45-4	
Matrix							SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
Sample Depth Interval (Ft)							0-0.1		0-0.1		0-0.1		0-0.1	
Sample Date							11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type							SA		SA		SA		SA	
Study ID							ESI		ESI		ESI		ESI	
Indeno(1,2,3-cd)pyrene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Isophorone	µG/L	0			0	4	10	U	11	U	11	U	10	U
Naphthalene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Nitrobenzene	µG/L	0			0	4	10	U	11	U	11	U	10	U
N-Nitroso-di-n-propylamine	µG/L	0			0	4	10	U	11	U	11	U	10	U
N-Nitrosodiphenylamine	µG/L	0			0	4	10	U	11	U	11	U	10	U
Pentachlorophenol	µG/L	0	1	0	0	4	26	U	27	U	26	U	25	U
Phenanthrene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Phenol	µG/L	0	5	0	0	4	10	U	11	U	11	U	10	U
Pyrene	µG/L	0			0	4	10	U	11	U	11	U	10	U
Herbicides														
2,4,5-T	µG/L	0			0	4	0.12	U	0.12	U	0.11	U	0.11	U
2,4,5-TP/Silvex	µG/L	0			0	4	0.12	U	0.12	U	0.11	U	0.11	U
2,4-D	µG/L	0			0	4	1.2	U	1.2	U	1.1	U	1.1	U
2,4-DB	µG/L	0			0	4	1.2	U	1.2	U	1.1	U	1.1	U
Dalapon	µG/L	0			0	4	2.6	U	2.6	U	2.5	U	2.4	U
Dicamba	µG/L	0			0	4	0.12	U	0.12	U	0.11	U	0.11	U
Dichloroprop	µG/L	0			0	4	1.2	U	1.2	U	1.1	U	1.1	U
Dinoseb	µG/L	0			0	4	0.56	U	0.56	U	0.54	U	0.52	U
MCPA	µG/L	0			0	4	120	U	120	U	110	U	110	U
MCPP	µG/L	0			0	4	120	U	120	U	110	U	110	U
Explosives														
1,3,5-Trinitrobenzene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
1,3-Dinitrobenzene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
2,4,6-Trinitrotoluene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
2,4-Dinitrotoluene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
2,6-Dinitrotoluene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
2-amino-4,6-Dinitrotoluene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
4-amino-2,6-Dinitrotoluene	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
HMX	µG/L	0.49			2	4	0.13	U	0.45		0.49		0.13	U
RDX	µG/L	2			2	4	0.24	J	2		0.13	U	0.13	U
Tetryl	µG/L	0			0	4	0.13	U	0.13	U	0.13	U	0.13	U
Pesticides/PCBs														
4,4'-DDD	µG/L	0	0.00008	0	0	4	0.1	U	0.1	U	0.12	U	0.12	U
4,4'-DDE	µG/L	0	0.000007	0	0	4	0.1	U	0.1	U	0.12	U	0.12	U
4,4'-DDT	µG/L	0	0.00001	0	0	4	0.1	U	0.1	U	0.12	U	0.12	U
Aldrin	µG/L	0	0.001	0	0	4	0.052	U	0.052	U	0.058	U	0.058	U
Alpha-BHC	µG/L	0			0	4	0.052	U	0.052	U	0.058	U	0.058	U
Alpha-Chlordane	µG/L	0			0	4	0.052	U	0.052	U	0.058	U	0.058	U
Aroclor-1016	µG/L	0	0.000001	0	0	4	1	U	1	U	1.2	U	1.2	U
Aroclor-1221	µG/L	0	0.000001	0	0	4	2.1	U	2.1	U	2.3	U	2.3	U
Aroclor-1232	µG/L	0	0.000001	0	0	4	1	U	1	U	1.2	U	1.2	U
Aroclor-1242	µG/L	0			0	4	1	U	1	U	1.2	U	1.2	U
Aroclor-1248	µG/L	0	0.000001	0	0	4	1	U	1	U	1.2	U	1.2	U
Aroclor-1254	µG/L	0	0.000001	0	0	4	1	U	1	U	1.2	U	1.2	U
Aroclor-1260	µG/L	0	0.000001	0	0	4	1	U	1	U	1.2	U	1.2	U
Beta-BHC	µG/L	0			0	4	0.052	U	0.052	U	0.058	U	0.058	U
Delta-BHC	µG/L	0			0	4	0.052	U	0.052	U	0.058	U	0.058	U
Dieldrin	µG/L	0	0.0000006	0	0	4	0.1	U	0.1	U	0.12	U	0.12	U
Endosulfan I	µG/L	0	0.009	0	0	4	0.052	U	0.052	U	0.058	U	0.058	U
Endosulfan II	µG/L	0	0.009	0	0	4	0.1	U	0.1	U	0.12	U	0.12	U
Endosulfan sulfate	µG/L	0			0	4	0.1	U	0.1	U	0.12	U	0.12	U
Endrin	µG/L	0	0.002	0	0	4	0.1	U	0.1	U	0.12	U	0.12	U
Endrin aldehyde	µG/L	0			0	4	0.1	U	0.1	U	0.12	U	0.12	U
Endrin ketone	µG/L	0			0	4	0.1	U	0.1	U	0.12	U	0.12	U
Gamma-BHC/Lindane	µG/L	0			0	4	0.052	U	0.052	U	0.058	U	0.058	U
Gamma-Chlordane	µG/L	0			0	4	0.052	U	0.052	U	0.058	U	0.058	U
Heptachlor	µG/L	0	0.0002	0	0	4	0.052	U	0.052	U	0.058	U	0.058	U
Heptachlor epoxide	µG/L	0	0.0003	0	0	4	0.052	U	0.052	U	0.058	U	0.058	U
Methoxychlor	µG/L	0	0.03	0	0	4	0.52	U	0.52	U	0.58	U	0.58	U
Toxaphene	µG/L	0	0.000006	0	0	4	5.2	U	5.2	U	5.8	U	5.8	U
Inorganics														
Aluminum	µG/L	37,500	100	4	4	4	**29,000**		**4,370**		**968**		**37,500**	
Antimony	µG/L	0			0	4	52.6	U	52.4	U	52.8	U	52.5	U
Arsenic	µG/L	2.3	150	0	1	4	1.2	U	1.2	U	1.2	U	2.3	J
Barium	µG/L	439			4	4	204		82.5	J	33.5	J	439	
Beryllium	µG/L	1.5	1,100	0	2	4	1.3	J	0.3	U	0.3	U	1.5	J
Cadmium	µG/L	11.2	3.84	1	1	4	3.3	U	3.3	U	3.3	U	**11.2**	
Calcium	µG/L	194,000			4	4	194,000		38,500		33,800		105,000	
Chromium	µG/L	50.8	139.45	0	3	4	45.4		3.4	J	2.5	U	50.8	
Cobalt	µG/L	18.2	5	2	2	4	**15.2**	**J**	4.9	U	4.9	U	**18.2**	**J**
Copper	µG/L	612	17.32	4	4	4	**203**		**119**		**24.8**	**J**	**612**	
Cyanide	µG/L	47.7	5.2	1	1	4	8.3	U	8.3	U	8.3	U	**47.7**	
Iron	µG/L	60,400	300	4	4	4	**47,700**	**J**	**5,920**	**J**	**1,270**	**J**	**60,400**	**J**
Lead	µG/L	68.7	1.4624632	4	4	4	**27.2**		**10.9**		**1.9**	**J**	**68.7**	
Magnesium	µG/L	24,300			4	4	24,300		4,680	J	3,280	J	19,300	
Manganese	µG/L	1,250			4	4	841		56.7		21.1		1,250	
Mercury	µG/L	3	0.0007	4	4	4	**0.32**		**0.5**		**0.18**	**J**	**3**	
Nickel	µG/L	74.2	99.92	0	4	4	72.7		8.1	J	4.2	J	74.2	
Potassium	µG/L	9,670			4	4	6,650		5,020		1,530	J	9,670	
Selenium	µG/L	0	4.6	0	0	4	5.5	U	1.1	U	1.1	U	5.5	U
Silver	µG/L	0	0.1	0	0	4	6.7	UJ	6.6	UJ	6.7	UJ	6.7	UJ
Sodium	µG/L	4,340			4	4	2,810	J	899	J	1,080	J	4,340	J
Thallium	µG/L	0	8	0	0	4	1.2	U	1.2	U	1.2	U	1.2	U
Vanadium	µG/L	54.9	14	2	3	4	**45.9**	**J**	6.1	J	3.3	U	**54.9**	
Zinc	µG/L	883	159.25	2	4	4	**226**		98.9		23.3		**883**	

Footnotes:

1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result value.
R = Rejected, data validation rejected the results.
2) Num of Analyses is the number of detected and non-detected results excluding rejected results.
3) Chemical results greater than the action level are highlighted, bolded and boxed.
4) Criteria source are the NYS AWQS Class D Values (http://www.dec.ny.gov/regs/4590.html).

Table A-4
Analytical Results for Ditch Soil Samples at OD Grounds
Feasibility Study - OD Grounds
Seneca Army Depot

Area							SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID							SW/SD45-1	SW/SD45-2	SW/SD45-3	SW/SD45-4
Matrix							SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample ID							SD45-1	SD45-2	SD45-3	SD45-4
Sample Depth Interval (FT)							0-0.5	0-0.5	0-0.5	0-0.5
Sample Date							11/1/1993	11/1/1993	11/1/1993	11/1/1993
QC Type							SA	SA	SA	SA
Study ID							ESI	ESI	ESI	ESI
Parameter	Units	Max Detected Value	Action Level	Detects Above Standard-	Num of Detects	Num of Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Volatile Organic Compounds										
1,1,1-Trichloroethane	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
1,1,2,2-Tetrachloroethane	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
1,1,2-Trichloroethane	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
1,1-Dichloroethane	UG/KG	0	240000	0	0	4	13 U	14 U	15 U	13 U
1,1-Dichloroethene	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
1,2-Dichloroethane	UG/KG	0	30000	0	0	4	13 U	14 U	15 U	13 U
1,2-Dichloroethene (total)	UG/KG	0		0	0	4	13 U	14 U	15 U	13 U
1,2-Dichloropropane	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Acetone	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
Benzene	UG/KG	0	44000	0	0	4	13 U	14 U	15 U	13 U
Bromodichloromethane	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Bromoform	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Carbon disulfide	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Carbon tetrachloride	UG/KG	0	22000	0	0	4	13 U	14 U	15 U	13 U
Chlorobenzene	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
Chlorodibromomethane	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Chloroethane	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Chloroform	UG/KG	0	350000	0	0	4	13 U	14 U	15 U	13 U
Cis-1,3-Dichloropropene	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Ethyl benzene	UG/KG	0	390000	0	0	4	13 U	14 U	15 U	13 U
Methyl bromide	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Methyl butyl ketone	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Methyl chloride	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Methyl ethyl ketone	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
Methyl isobutyl ketone	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Methylene chloride	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
Styrene	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Tetrachloroethene	UG/KG	0	150000	0	0	4	13 U	14 U	15 U	13 U
Toluene	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
Total Xylenes	UG/KG	0	500000	0	0	4	13 U	14 U	15 U	13 U
Trans-1,3-Dichloropropene	UG/KG	0	0	0	0	4	13 U	14 U	15 U	13 U
Trichloroethene	UG/KG	0	200000	0	0	4	13 U	14 U	15 U	13 U
Vinyl chloride	UG/KG	0	13000	0	0	4	13 U	14 U	15 U	13 U
Herbicides										
2,4,5-T	UG/KG	0	0	0	0	4	6.4 U	8 U	7.6 U	6.8 U
2,4,5-TP/Silvex	UG/KG	0	500000	0	0	4	6.4 U	8 U	7.6 U	6.8 U
2,4-D	UG/KG	0	0	0	0	4	64 U	80 U	76 U	68 U
2,4-DB	UG/KG	0	0	0	0	4	64 U	80 U	76 U	68 U
Dalapon	UG/KG	0	0	0	0	4	160 U	200 U	190 U	170 U
Dicamba	UG/KG	0	0	0	0	4	6.4 U	8 U	7.6 U	6.8 U
Dichloroprop	UG/KG	0	0	0	0	4	64 U	80 U	76 U	68 U
Dinoseb	UG/KG	0	0	0	0	4	32 U	40 U	38 U	34 U
MCPA	UG/KG	0	0	0	0	4	6,400 U	8,000 U	7,600 U	6,800 U
MCPP	UG/KG	0	0	0	0	4	6,400 U	8,000 U	7,600 U	6,800 U
Explosives										
1,3,5-Trinitrobenzene	UG/KG	0		0	0	4	130 U	130 U	130 U	130 U
1,3-Dinitrobenzene	UG/KG	0		0	0	4	130 U	130 U	130 U	130 U
2,4,6-Trinitrotoluene	UG/KG	120		0	1	4	130 U	120 J	130 U	130 U
2,4-Dinitrotoluene	UG/KG	83		0	1	4	130 U	83 J	130 U	130 U
2,6-Dinitrotoluene	UG/KG	0		0	0	4	130 U	130 U	130 U	130 U
2-amino-4,6-Dinitrotoluene	UG/KG	260		0	1	4	130 U	260	130 U	130 U
4-amino-2,6-Dinitrotoluene	UG/KG	0		0	0	4	130 U	130 U	130 U	130 U
HMX	UG/KG	0		0	0	4	130 U	130 U	130 U	130 U
RDX	UG/KG	210		0	1	4	130 U	210	130 U	130 U
Tetryl	UG/KG	140		0	1	4	130 U	140 J	130 U	130 U
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
1,2-Dichlorobenzene	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
1,3-Dichlorobenzene	UG/KG	0	280000	0	0	4	420 U	530 U	500 U	440 U
1,4-Dichlorobenzene	UG/KG	0	130000	0	0	4	420 U	530 U	500 U	440 U
2,2'-oxybis(1-Chloropropane)	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2,4,5-Trichlorophenol	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
2,4,6-Trichlorophenol	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2,4-Dichlorophenol	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2,4-Dimethylphenol	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2,4-Dinitrophenol	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
2,4-Dinitrotoluene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2,6-Dinitrotoluene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2-Chloronaphthalene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2-Chlorophenol	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2-Methylnaphthalene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
2-Methylphenol	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
2-Nitroaniline	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
2-Nitrophenol	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
3,3'-Dichlorobenzidine	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
3-Nitroaniline	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
4,6-Dinitro-2-methylphenol	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
4-Bromophenyl phenyl ether	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
4-Chloro-3-methylphenol	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
4-Chloroaniline	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
4-Chlorophenyl phenyl ether	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
4-Methylphenol	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
4-Nitroaniline	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
4-Nitrophenol	UG/KG	0		0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
Acenaphthene	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
Acenaphthylene	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
Anthracene	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
Benzo(a)anthracene	UG/KG	32	5600	0	2	4	420 U	32 J	23 J	440 U
Benzo(a)pyrene	UG/KG	37	1000	0	2	4	420 U	37 J	28 J	440 U
Benzo(b)fluoranthene	UG/KG	37	5600	0	2	4	420 U	37 J	28 J	440 U
Benzo(ghi)perylene	UG/KG	48	500000	0	1	4	420 U	48 J	500 U	440 U
Benzo(k)fluoranthene	UG/KG	28	56000	0	2	4	420 U	28 J	26 J	440 U
Bis(2-Chloroethoxy)methane	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Bis(2-Chloroethyl)ether	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U

Bis(2-Ethylhexyl)phthalate	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Butylbenzylphthalate	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Carbazole	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Chrysene	UG/KG	50	56000	0	3	4	420 U	50 J	36 J	20 J
Dibenz(a,h)anthracene	UG/KG	0	560	0	0	4	420 U	530 U	500 U	440 U
Dibenzofuran	UG/KG	0	350000	0	0	4	420 U	530 U	500 U	440 U
Diethyl phthalate	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Dimethylphthalate	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Di-n-butylphthalate	UG/KG	25		0	1	4	420 U	25 J	500 U	440 U
Di-n-octylphthalate	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Fluoranthene	UG/KG	60	500000	0	3	4	420 U	60 J	47 J	31 J
Fluorene	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
Hexachlorobenzene	UG/KG	40	6000	0	2	4	420 U	40 J	500 U	30 J
Hexachlorobutadiene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Hexachlorocyclopentadiene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Hexachloroethane	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Indeno(1,2,3-cd)pyrene	UG/KG	32	5600	0	1	4	420 U	32 J	500 U	440 U
Isophorone	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Naphthalene	UG/KG	24	500000	0	1	4	420 U	530 U	500 U	24 J
Nitrobenzene	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
N-Nitroso-di-n-propylamine	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
N-Nitrosodiphenylamine	UG/KG	0		0	0	4	420 U	530 U	500 U	440 U
Pentachlorophenol	UG/KG	0	6700	0	0	4	1,000 U	1,300 U	1,200 U	1,100 U
Phenanthrene	UG/KG	34	500000	0	3	4	420 U	34 J	24 J	25 J
Phenol	UG/KG	0	500000	0	0	4	420 U	530 U	500 U	440 U
Pyrene	UG/KG	110	500000	0	3	4	420 U	110 J	59 J	61 J
Pesticides/PCBs										
4,4'-DDD	UG/KG	0	92000	0	0	4	4.2 U	5.3 U	5 U	4.5 U
4,4'-DDE	UG/KG	12	62000	0	2	4	4.2 U	4.3 J	5 U	12 J
4,4'-DDT	UG/KG	0	47000	0	0	4	4.2 U	5.3 U	5 U	4.5 U
Aldrin	UG/KG	2.2	680	0	1	4	2.2 U	2.7 U	2.6 U	2.2 J
Alpha-BHC	UG/KG	0	3400	0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Alpha-Chlordane	UG/KG	5.7	24000	0	1	4	2.2 U	2.7 U	2.6 U	5.7 J
Aroclor-1016	UG/KG	0	1000	0	0	4	42 U	53 U	50 U	45 U
Aroclor-1221	UG/KG	0	1000	0	0	4	85 U	110 U	100 U	91 U
Aroclor-1232	UG/KG	0	1000	0	0	4	42 U	53 U	50 U	45 U
Aroclor-1242	UG/KG	0	1000	0	0	4	42 U	53 U	50 U	45 U
Aroclor-1248	UG/KG	0	1000	0	0	4	42 U	53 U	50 U	45 U
Aroclor-1254	UG/KG	580	1000	0	2	4	42 U	74	50 U	580 J
Aroclor-1260	UG/KG	0	1000	0	0	4	42 U	53 U	50 U	45 U
Beta-BHC	UG/KG	0	3000	0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Delta-BHC	UG/KG	0	500000	0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Dieldrin	UG/KG	7.4	1400	0	1	4	4.2 U	5.3 U	5 U	7.4 J
Endosulfan I	UG/KG	2.7	200000	0	2	4	2.2 U	2.7 J	1.3 J	2.3 U
Endosulfan II	UG/KG	0	200000	0	0	4	4.2 U	5.3 U	5 U	4.5 U
Endosulfan sulfate	UG/KG	0	200000	0	0	4	4.2 U	5.3 U	5 U	4.5 U
Endrin	UG/KG	0	89000	0	0	4	4.2 U	5.3 U	5 U	4.5 U
Endrin aldehyde	UG/KG	3.2		0	1	4	4.2 U	5.3 U	5 U	3.2 J
Endrin ketone	UG/KG	0		0	0	4	4.2 U	5.3 U	5 U	4.5 U
Gamma-BHC/Lindane	UG/KG	0	9200	0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Gamma-Chlordane	UG/KG	0		0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Heptachlor	UG/KG	0	15000	0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Heptachlor epoxide	UG/KG	0		0	0	4	2.2 U	2.7 U	2.6 U	2.3 U
Methoxychlor	UG/KG	0		0	0	4	22 U	27 U	26 U	23 U
Toxaphene	UG/KG	0		0	0	4	220 U	270 U	260 U	230 U
Inorganics		0		0	0	0				
Aluminum	MG/KG	35,000		0	4	4	14,400	35,000	22,300	21,100
Antimony	MG/KG	0		0	0	4	10.1 U	13.4 U	11.7 U	7.2 UJ
Arsenic	MG/KG	16.1	16	1	4	4	6.9	4.2	7.3	**16.1**
Barium	MG/KG	308	400	0	4	4	85.4	308	187	176
Beryllium	MG/KG	1.4	590	0	4	4	0.62 J	1.4	0.94 J	0.83
Cadmium	MG/KG	25.6	9.3	2	4	4	0.76 J	**14.9**	5.6	**25.6** J
Calcium	MG/KG	84,400		0	4	4	84,400	21,700	25,100	25,100
Chromium	MG/KG	48.4		0	4	4	22.5	48.4	31.4	31.8
Cobalt	MG/KG	19.7		0	4	4	11.2	19.7	12.9	13.2
Copper	MG/KG	814	270	2	4	4	63.9	**814**	**323**	241
Cyanide	MG/KG	0	27	0	0	4	0.61 U	0.68 U	0.74 U	0.68 U
Iron	MG/KG	50,500		0	4	4	25,600	50,500	32,600	33,200
Lead	MG/KG	101	1000	0	4	4	19.8	101	52.8	72.9
Magnesium	MG/KG	10,200		0	4	4	9,720	10,200	7,630	7,510
Manganese	MG/KG	935	10000	0	4	4	458	692	616	935
Mercury	MG/KG	5.3	2.8	2	4	4	0.38	**5.3**	**4.4**	2.2 J
Nickel	MG/KG	67.7	310	0	4	4	40.1	67.7	41.6	44.6
Potassium	MG/KG	4,680		0	4	4	2,580	4,680	3,360	2,840
Selenium	MG/KG	0	1500	0	0	4	0.19 U	0.35 U	0.24 U	0.28 UJ
Silver	MG/KG	5.8	1500	0	3	4	1.3 U	5.8	3.1	2.5 J
Sodium	MG/KG	377		0	4	4	208 J	377 J	146 J	130 J
Thallium	MG/KG	0		0	0	4	0.21 U	0.38 U	0.26 U	0.31 U
Vanadium	MG/KG	53.7		0	4	4	23.9	53.7	37.2	32.9
Zinc	MG/KG	755	10000	0	4	4	104	755	312	329

Footnotes:

1) Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or J = estimated (detect or non-detect) value.
[blank] = detect, i.e. detected chemical result
2) Num of Analyses is the number of detected and non-detected results excluding rejected results.
3) Chemical results greater than the action level are highlighted, bolded and boxed.
4) Criteria action level source document and web address. The NYS SCO Commercial Use values were obtained from the NYSDEC Soil Cleanup Objectives (6 NYCRR Subpart 375-6). http://www.dec.ny.gov/regs/15507.html

Table A-5
Comparison of Total Metal in Soil to SPLP Extract Concentrations

Seneca Army Depot

Parameter	Soil Guidance Values EPA RSL Residential RSL mg/Kg	 NYSDEC Unrestricted SCO mg/Kg	NYSDEC GA GW Effluent ug/L	Number of Exceedances	SEAD-45 S45-0DH-4-01 SOIL S45-0DH-4-01 X Y 3/12/2010 SA mg/Kg Value (Q)	*SEAD-45* *S45-0DH-4-01* *Leachate* *S45-0DH-4-01* *X* *Y* *3/12/2010* *SA* ug/L Value (Q)	SEAD-45 S45-TP-1-02 SOIL S45-TP-1-02 X Y 3/12/2010 SA mg/Kg Value (Q)	*SEAD-45* *S45-TP-1-02* *Leachate* *S45-TP-1-02* *X* *Y* *3/12/2010* *SA* ug/L Value (Q)	SEAD-45 S45-TP-2-04 SOIL S45-TP-2-04 X Y 3/12/2010 SA mg/Kg Value (Q)	SEAD-45 S45-TP-2-04 Leachate S45-TP-2-04 X Y 3/12/2010 SA ug/L Value (Q)
ALUMINUM	**7700**				**15000**		**14400**		**16500**	
ANTIMONY	3.1		*6*		0.47 U	*ND*	0.63 J	*ND*	0.29 J	*2.6 J*
ARSENIC	**0.39**	13	*50*		**12.6**	*7.4 J*	**8.7**	*1.86 U*	**4.8**	*16*
BARIUM	1500	350	*2000*		220	*495*	101	*132*	227	*1340*
BERYLLIUM	16	7.2			0.67		0.62		0.73	
CADMIUM	**7**	**2.5**	***10***	4	**1100**	***11***	**13.4**	*0.6 J*	**7.6**	***18.9***
CALCIUM					23200		62400		29500	
CHROMIUM	12000	**30**	*100*		**37.8**	*38.3*	**35**	*12.7 J*	26.7	*77.2*
COBALT	**2.3**				**14**	*10.5 J*	**12.9**	*2.3 J*	**11.3**	*32*
COPPER	**310**	**50**	***1000***	2	**1780**	*909*	**7310**	*139*	**2490**	*716*
IRON	**5500**				**118000**		**60900**		**25600**	
LEAD	**40**	**63**	***50***	6	**57.2**	***78***	22.3	*8.7*	**91**	***274***
MAGNESIUM					5680		9200		7380	
MANGANESE	**180**	1600			**648**		**574**		**407**	
MERCURY	**2.3**	**0.18**	***1.4***	6	**3.1**	***12.7 (1)***	**4.3**	*0.27 (1)*	**9.1**	***44.2 (1)***
NICKEL	150	**30**			**46.2**		**54**		**38.2**	
POTASSIUM					2160		2180		2400	
SELENIUM	39	3.9	*20*		1.03 U	*3.67 U*	0.59 U	*3.67 U*	0.4 U	*3.67 U*
SILVER	**39**	**2**	*100*		**205**	*6.2 J*	**53.7**	*0.75 J*	0.63 J	*3.5 J*
SODIUM					103		151		189	
THALLIUM					0.44 U		0.25 U		0.17 U	
VANADIUM	**0.55**				**24.4**	*50*	**22.3**	*19 J*	**26.9**	*98*
ZINC	2300	**109**	*5000 (3)*		**1270**	*767*	**150**	*100*	**1470**	*2770*

Key

0.55	**Exceeds most stringent soil criterion only**
39	**Exceeds most liberal and most stringent soil criterion**
0.7	**Exceeds most stringent groundwater criterion only**
1.4	**Exceeds most liberal and most stringent groundwater criteria**
(1)	**Mercury data may be affected by holding times greater than 28 days.**
(2)	**Based on Federal MCL**
(3)	**NYSDEC Guidance Value, GA Freshwater Aesthetics**

Table A-5
Comparison of Total Metal in Soil to SPLP Extract Concentrations

Seneca Army Depot

Parameter	Soil Guidance Values: EPA RSL Residential RSL mg/Kg	Soil Guidance Values: NYSDEC Unrestricted SCO mg/Kg	NYSDEC GA GW Effluent ug/L	Number of Exceedances	SEAD-45 S45-R4-01 SOIL S45-R4-01 0 0.2 4/1/2010 SA mg/Kg Value	(Q)	SEAD-45 S45-R4-01 Leachate S45-R4-01 0 0.2 4/1/2010 SA ug/L Value	(Q)	SEAD-45 S45-RI-02 SOIL S45-RI-02 0 0.2 4/1/2010 SA mg/Kg Value	(Q)	SEAD-45 S45-RI-02 Leachate S45-RI-02 0 0.2 4/1/2010 SA ug/L Value	(Q)	SEAD-45 S45-R2-02 SOIL S45-R2-02 0 0.2 4/1/2010 SA mg/Kg Value	(Q)	SEAD-45 S45-R2-02 Leachate S45-R2-02 0 0.2 4/1/2010 SA ug/L Value	(Q)
ALUMINUM	**7700**				**19000**				**16200**				**17700**			
ANTIMONY	3.1		*6*		0.18	U	*ND*		0.64	J	*ND*		0.62	J	*3.7*	*J*
ARSENIC	**0.39**	13	*50*		**5.7**		*11.6*		**5.1**		*13.6*		**5.4**		*18.9*	
BARIUM	1500	350	*2000*		140		*562*		150		*777*		164		*940*	
BERYLLIUM	16	7.2			0.88				0.72				0.86			
CADMIUM	**7**	**2.5**	***10***	4	1.1	J	*4*	*J*	**7.7**		***17.3***		**9.1**		***25.3***	
CALCIUM					12200				25400				20300			
CHROMIUM	12000	**30**	*100*		**2804**		*52*		27.4		*73*		27.7		*99.9*	
COBALT	**2.3**				**10.9**		*11.7*	*J*	**12.3**		*37.5*		**11.8**		*29*	*J*
COPPER	**310**	**50**	***1000***	2	**82.6**		*243*		**794**		***1444***		**462**		***2260***	
IRON	**5500**				**24000**				**25200**				**27600**			
LEAD	**40**	**63**	***50***	6	22.5		***52***		**69.2**		***147***		**72.3**		***193***	
MAGNESIUM					6750				7910				6560			
MANGANESE	**180**	1600			**428**				**676**				**618**			
MERCURY	**2.3**	**0.18**	***1.4***	6	**1.4**		***12.2***		**3.5**		***13.2***		**3**		***9.8***	
NICKEL	150	**30**			**37**				**39.6**				**39.8**			
POTASSIUM					2970				2450				2920			
SELENIUM	39	3.9	*20*		0.63	U	*3.67*	*U*	0.7	U	*3.67*	*U*	0.72	U	*3.67*	*U*
SILVER	**39**	**2**	*100*		0.42	J	*2*	*J*	**3.2**		*13.6*	*J*	**3.6**		*19.7*	
SODIUM					79	J			87.7	J			90.9	J		
THALLIUM					0.27	U			0.29	U			0.3	U		
VANADIUM	**0.55**				**33.6**		*6.8*	*J*	**27.3**		*93*		**30.9**		*124*	
ZINC	2300	**109**	*5000 (3)*		**160**		*1030*		**1350**		*3100*		**321**		*1750*	

Key

0.55	**Exceeds most stringent soil criterion only**
39	**Exceeds most liberal and most stringent soil criterion**
0.7	**Exceeds most stringent groundwater criterion only**
1.4	**Exceeds most liberal and most stringent groundwater criteria**
(1)	**Mercury data may be affected by holding times greater than 28 days.**
(2)	**Based on Federal MCL**
(3)	**NYSDEC Guidance Value, GA Freshwater Aesthetics**

Table A-5
Comparison of Total Metal in Soil to SPLP Extract Concentrations

Seneca Army Depot

Parameter	EPA RSL Residential RSL mg/Kg	NYSDEC Unrestricted SCO mg/Kg	NYSDEC GA GW Effluent ug/L	Number of Exceedances	SEAD-45 S45-R5-05 SOIL S45-R5-05 0.2 0.8 3/16/2010 SA mg/Kg Value	(Q)	SEAD-45 S45-R5-05 Leachate S45-R5-05 0.2 0.8 3/16/2010 SA ug/L Value	(Q)	SEAD-45 S45-R15-01 SOIL S45-R15-01 0.2 0.8 3/16/2010 SA mg/Kg Value	(Q)	SEAD-45 S45-R15-01 Leachate S45-R15-01 0.2 0.8 3/16/2010 SA ug/L Value	(Q)
ALUMINUM	**7700**				**18700**				**19900**			
ANTIMONY	3.1		*6*		0.11	U	*ND*		0.25	U	*ND*	
ARSENIC	**0.39**	13	*50*		**5.2**		*9.8*		**7.6**		*6.8*	*J*
BARIUM	1500	350	*2000*		165		*703*		287		*487*	
BERYLLIUM	16	7.2			0.79				1			
CADMIUM	**7**	**2.5**	***10***	4	**5.1**		*8.7*	*J*	1.8	J	*1.2*	*J*
CALCIUM					29300				3630			
CHROMIUM	12000	**30**	*100*		26.7		*63.1*		24.6		*53.6*	
COBALT	**2.3**				**10**		*16.7*	*J*	**26.8**		*11.9*	*J*
COPPER	**310**	**50**	***1000***	2	**219**		*654*		22.8		*59.5*	
IRON	**5500**				**25400**				**35300**			
LEAD	**40**	**63**	***50***	6	**42.9**		***71***		22		*29*	
MAGNESIUM					7140				4080			
MANGANESE	**180**	1600			**489**				**5040**			
MERCURY	**2.3**	**0.18**	***1.4***	6	**1.3**		***4.2 (1)***		**0.21**		*0.34 (1)*	
NICKEL	150	**30**			**33.4**				29.8			
POTASSIUM					3220				2780			
SELENIUM	39	3.9	*20*		0.24	U	*3.67*	*U*	0.56	U	*3.67*	*U*
SILVER	**39**	**2**	*100*		0.46	J	*3.1*	*J*	0.17	U	*2.1*	*J*
SODIUM					127				87.4	J		
THALLIUM					0.1	U			0.24	U		
VANADIUM	**0.55**				**30.1**		*79*		**30.7**		*78*	
ZINC	2300	**109**	*5000 (3)*		**360**		*1290*		101		*243*	

Soil Guidance Values: EPA RSL Residential RSL; NYSDEC Unrestricted SCO.

Key

0.55	**Exceeds most stringent soil criterion only**
39	**Exceeds most liberal and most stringent soil criterion**
0.7	**Exceeds most stringent groundwater criterion only**
1.4	**Exceeds most liberal and most stringent groundwater criteria**
(1)	**Mercury data may be affected by holding times greater than 28 days.**
(2)	**Based on Federal MCL**
(3)	**NYSDEC Guidance Value, GA Freshwater Aesthetics**

APPENDIX B

HUMAN HEALTH RISK ASSESSMENT

APPENDIX B
HUMAN HEALTH RISK ASSESSMENT REPORT
SENECA ARMY DEPOT ACTIVITY
OPEN DETONATION (OD) GROUNDS

February 19, 2015, Draft Revision 0

Contract Number W912DY-08-D-0003, Task Order 0013

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ACRONYMS AND ABBREVIATIONS

≤	less than or equal to
µg	micrograms
ALM	adult lead model
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
COPC	constituents of potential concern
cm^2	square centimeter
CSM	conceptual site model
DAD	dermal absorbed dose
dL	deciliter
DQO	data quality objectives
ELCR	excess lifetime cancer risk
EPC	exposure point concentrations
FS	feasibility study
HEAST	health effects assessment summary table
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IEUBK	integrated exposure uptake biokinetic
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
kg	kilogram
L	liter
LOAEL	lowest observed adverse effect level
m^3	cubic meter
MCL	maximum contaminant level
MD	munitions debris
MDL	method detection limit
MEC	munitions and explosives of concern
mg	milligrams
MRL	minimal risk level
NYSDEC	New York State Department of Environmental Conservation
NOAEL	no observed adverse effect level
OB	open burning
OD	open detonation
OEHHA	California EPA Office of Environmental Health Hazard Assessment
Pb	lead
PEF	particulate emission factor
PPRTV	provisional peer-reviewed toxicity value
Q/C	default source concentration terms or values
RAGS	Risk Assessment Guidance for Superfund
REL	reference exposure level
RfC	reference concentrations
RfD	reference doses
RME	reasonable maximum exposure

ACRONYMS AND ABBREVIATIONS (*continued*)

RSL	regional screening level
SEDA	Seneca Army Depot Activity
SF	slope factor
STSC	Superfund Health Risk Technical Support Center
SVOC	semivolatile organic compound
UCL	upper confidence limit
USEPA	U.S. Environmental Protection Agency
VF	volatilization factor

SECTION 1
INTRODUCTION

1.1 Overall Introduction

This risk assessment is being conducted to support the feasibility study (FS) for the Open Detonation (OD) Grounds, Seneca Army Depot Activity (SEDA). The risk assessment generally follows U.S. Environmental Protection Agency (USEPA) guidance for risk assessment (the Risk Assessment Guidance for Superfund [RAGS] series of guidance documents), and incorporates exposure scenarios and assumptions that are appropriate for current and anticipated future land use at this site. These scenarios and assumptions, as well as methods proposed to calculate exposure point concentrations and identify chemicals of potential concern, were presented in a human health risk assessment technical memorandum submitted to USEPA and the New York State Department of Environmental Conservation (NYSDEC) for review on August 7, 2014.

This risk assessment is an attachment to the FS. Therefore, complete historical site information is available within the FS. Section 1 of this report is a brief introduction, including a description of the site and the data evaluation for the human health risk assessment (HHRA). Section 2 describes the HHRA. Section 3 presents the references used in preparation of this document. Tables and figures referenced in this report follow Section 3.

1.2 Site Description

SEDA is located in Seneca County, New York (Figure 1.1), while the OD Grounds site is located in the northwest corner of SEDA (Figure 1.2). The site is largely meadow with some wooded and heavily brushed areas. The site consists of 403 acres and was used to perform open detonation (OD) and burning of munitions. OD activities no longer occur at this site. This acreage includes the area contained within a 2,500-foot radius centered on the OD Hill Area. Note that the Open Burning (OB) Grounds is a separate site that was previously addressed and are is included in the calculation of OD Grounds acreage. This Risk Assessment divides the OD Grounds into two areas for assessment purposes based on differing potential risk observed during previous investigations. The density of potential MEC is highest at the center of the OD Grounds, in the vicinity of the OD Hill where the demolition activities took place and areas in the immediate vicinity that received most of the “kick-outs” from those activities. This area is referred to as the “OD Hill area” in this Risk Assessment. The second area includes areas further away from the OD Hill that received kick-outs, but in lower densities. This second assessment area is referred to as the “Kickout Area”.

Under the future use plan, the OD Grounds are located in the “Conservation/Recreation” parcel of SEDA. The planned future use for the OD Grounds is for conservation and passive recreational purposes where there is limited potential for soil contact (e.g., does not include playgrounds or ballparks, but would include hiking or nature trails). Planned future recreational use of the site does not include overnight camping.

Groundwater use at the site will be prohibited through implementation of a land use control as part of the final remedy; therefore, groundwater is not currently used for any purpose and is not anticipated to be used for any purpose in the future. Depth to groundwater is approximately 10 feet below ground surface. There will be land use restrictions in place that will prevent intrusive activity and future development of the site beyond its prescribed conservation/recreation use.

The only perennial surface water feature located within the OD Grounds is Reeder Creek, which flows north through the Kickout Area. Reeder Creek is not used for fishing or as a source of potable water. Additionally, the creek is not deep enough to support swimming. There are no perennial surface water bodies in the OD Hill Area.

Further details on the site characteristics (i.e., geology, hydrogeology, etc.), history, and future use are provided in Section 1.2 of the FS.

1.3 Data Evaluation

Historical soil, surface water, sediment, and groundwater data were evaluated for appropriateness and representativeness to determine usability for risk assessment. A data usability evaluation was conducted to evaluate whether the available current and historical data should be used in the risk assessment.

Chemical results with final validation qualifiers of any letter other than "U," "UJ," or "R" were considered detected; therefore "J" qualified data results were used in the risk assessment (USEPA 1989). Original data files are included in Attachment A.

To evaluate usability, data for each medium (and from each soil interval) within each exposure area (as defined below in Section 2.3) were consolidated into summary statistics tables that present the following for each analyte: number of samples analyzed, minimum and maximum detected values, minimum and maximum method detection limits (MDL) for nondetects, and the screening value. These summary statistics for soil (including ditch soil, see below), surface water, and groundwater samples at the OD Grounds, are presented in the following tables:

- Table 1.1 (surface soil, 0- less than or equal to (≤) 2 feet, OD Hill Area);
- Table 1.2 (subsurface soil, 0- ≤ 15 feet, OD Hill Area);
- Table 1.3 (surface soil, 0- ≤ 2 feet, Kickout Area);
- Table 1.4 (groundwater);
- Table 1.5 (surface water, upstream);
- Table 1.6 (surface water, ditch samples from OD Hill Area);
- Table 1.7 (surface water, Reeder Creek and Downstream of OD Hill Area).

Determination of data usability was based on evaluation of the spatial, chemical, and temporal representativeness of the available analytical data, and an assessment of whether these data are relevant to plausible exposure pathways at the OD Grounds. Representativeness of the data was evaluated using the criteria defined below.

- **Chemical representativeness** – Identifies whether analyses were conducted for constituents expected to be present, on the basis of an understanding of historical processes or practices and potential releases at the OD Grounds.
- **Exposure representativeness** – Identifies whether environmental media were evaluated where receptor exposure is most feasible (e.g., soil depths).
- **Spatial representativeness** – Identifies whether samples were collected with a sufficient density and areal coverage that the detected constituent concentrations represent a geographically integrated exposure for the receptors of concern.

- **Temporal representativeness** – Identifies whether samples were collected within a time frame such that detected constituent concentrations represent current site conditions. Data were also evaluated based on current standard practices to determine if historical data were collected in a manner that would meet current data quality objectives (DQO).

Soil data used in this risk assessment include data from samples collected in November 1993 and March 2010. Soil data are presented in two soil intervals: 0 to ≤ 2 feet below ground surface (bgs) (Tables 1.1 and 1.3) and 0 - ≤ 15 feet bgs (Table 1.2). Soil sample locations and exposure area are included on Figure 1.3.

Groundwater data used in this risk assessment include data from January and February 1994, June 1997, and December 1999 (Table 1.4). Groundwater sample locations and human health exposure areas are included on Figure 1.5. Groundwater samples collected within the OD Hill Area are not temporally representative (collected prior to 1995) but, as proposed in the technical memorandum, are included in the HHRA to spatially evaluate groundwater, as they are the most recent data available specific to this area. Groundwater samples collected from the OB Area (which is not being evaluated in this risk assessment) are not spatially representative (side-gradient to the potential source) but, as proposed in the technical memorandum, are included in the HHRA to temporally evaluate the OD Hill Area, as they are the most recent data available.

Surface water data used in the this risk assessment include data collected from ditches in 1993 from within the OD Hill Area, samples collected from Reeder Creek in 1991 and 1992 from the Kickout Area, and samples collected from Reeder Creek in 1997 in support of the investigation conducted at SEAD-12, which is located upgradient of the OD Grounds. Samples collected in Reeder Creek upstream of the OD Grounds will be evaluated separately from those collected within and downstream of the OD Grounds, as upstream samples are not expected to have been affected by activities at the OD Grounds (Table 1.7). The upstream samples will be used to determine the impact the OD Grounds may have on contaminant concentrations in Reeder Creek.

Historically, sediment samples were collected from Reeder Creek. However, subsequent to sample collection, remedial actions were taken in the creek, resulting in removal of all sediment in the vicinity of the OD Grounds. Therefore, historical samples are not representative of current conditions. In addition, Reeder Creek is currently inspected, and annual observations confirm that there is no sediment in the creek. Therefore, there are no complete sediment exposure pathways.

The data tables present all samples, primary and duplicates. The “best value” sample result of all primary and duplicate results was used. If both values represent detected concentrations, then the highest detected concentration was retained. If one value represents a detected concentration and one value is qualified as not detected, then the detected value was retained. If both values are qualified as not detected, the lowest reporting limit was retained.

Calcium, iron, magnesium, potassium, and sodium were not evaluated in the HHRA because they are essential nutrients and are generally not expected to pose an unacceptable risk to human receptors.

SECTION 2
HUMAN HEALTH RISK ASSESSMENT

2.1 Risk Assessment Process

The HHRA provides an evaluation of the potential risks to human health posed by constituents detected in surface soil, combined surface and subsurface soil, groundwater, and surface water associated with the OD Grounds at SEDA. As presented in USEPA guidance documents, the HHRA is a four-step evaluation process that includes:

- Data evaluation and identification of a constituent of potential concern (COPC);
- Exposure assessment;
- Toxicity assessment; and
- Risk characterization.

Each step is discussed in detail in the following subsections. The HHRA was conducted using the following USEPA guidance documents:

- RAGS, Volume I: Human Health Evaluation Manual, Part A (Interim Final) (USEPA 1989)
- RAGS, Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment (Final) (USEPA 2004)
- Soil Screening Guidance: Users Guide (USEPA 1996a)
- RAGS, Volume I: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment (Final) (USEPA 2009a)

2.2 Identification of Constituents of Potential Concern

2.2.1 Selection of Constituents of Potential Concern

Concentrations of detected constituents were compared to screening levels to identify COPCs. COPCs were selected by comparing the maximum concentration of each detected analyte in soil (for both soil intervals), groundwater, and surface water samples to selected screening levels. Analytes present at concentrations greater than screening levels were retained as COPCs for further evaluation; constituents detected at concentrations below these screening levels were not considered COPCs. The screening criteria selected for soil, groundwater, and surface water are the USEPA Regional Screening Levels (RSL) for Chemicals at Superfund Sites (USEPA 2013a). Detected analytes lacking screening levels were carried forward to the site-specific risk assessment and evaluated using surrogates, as discussed below.

USEPA RSLs for residential soil, based on a noncarcinogenic hazard quotient (HQ) of 0.1, were the selected screening values for soil. The maximum detected concentration of each detected analyte in surface soil (0 - ≤ 2 feet bgs) and combined surface and subsurface soil (0 - ≤ 15 feet bgs) were compared to these screening levels.

USEPA RSLs for tap water, based on a noncarcinogenic HQ of 0.1, were the selected screening values for groundwater and surface water. Tap water RSLs are based on ingestion, dermal contact, and inhalation of volatiles emitted from groundwater. Although surface water at the site is not used for drinking water, the USEPA RSLs for tap water were used for screening of surface water. The maximum detected concentration of each detected analyte in groundwater or surface water was compared to the selected screening value. For surface water, the maximum detected concentrations of each detected analyte in surface water for each evaluation area (on-site drainage ditches, upstream in Reeder Creek, or downstream in Reeder Creek) were compared to the selected screening value.

Chromium can exist in the environment as chromium(III) and chromium(VI). The analytical results presented in this report are for chromium(total) and do not distinguish between the different valence states. The chromium(total) analytical results are screened using the RSLs for chromium(VI). Toxicity criteria are established for chromium(III) and chromium(VI); therefore, the risk estimate presented in Section 2.5 calculates risk for both chromium(III) and chromium(VI) using the chromium(total) exposure point concentration (EPC). Two separate risk estimates are presented. One risk estimate assumes the chromium is present as chromium(III) and the other risk assessment assumes the chromium is present as chromium(VI).

Potential risks associated with exposure to lead are evaluated using methods different from those used for carcinogens and noncarcinogens. The end point for lead evaluation is a blood lead level, rather than a carcinogenic risk or HQ. Therefore, lead is not included in the cumulative risk calculations in Section 2.5. Lead is evaluated using the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model for children (USEPA 2007) or the USEPA Adult Lead Model (ALM) (USEPA 2003; 2009b). These models estimate potential blood lead (Pb) concentrations (micrograms [µg]-Pb per deciliter [dL]-blood) based on assumed exposures to lead in environmental media.

The predicted blood-lead concentrations will be compared to the blood-lead level of concern of 10 µg/dL (USEPA 2007). USEPA typically considers that action may be warranted if the 95th percentile predicted blood-lead concentration exceeds 10 µg/dL (i.e., action may be considered if there is greater than a 5% chance a receptor exposed to lead could have a blood-lead level greater than 10 µg/dL). However, based on USEPA's current approach, blood-lead concentrations less than 10 µg/dL do not require further management of the risk associated with exposure to lead.

2.2.2 Constituents of Potential Concern Results

Surface Soil: As shown on Tables 2.1 and 2.3, the following 20 analytes were detected at concentrations exceeding selected screening criteria in either the OD Hill Area or the Kickout Area, and were identified as COPCs in surface soil:

- 2,4-Dinitrotoluene
- Benzo(a)pyrene
- Benzo(g,h,i)perylene
- N-Nitrosodipropylamine
- Phenanthrene
- MCPA
- Nitroglycerine
- Aroclor-1254
- Aluminum
- Arsenic
- Cadmium
- Chromium (total)
- Cobalt
- Copper
- Lead
- Manganese
- Mercury
- Silver
- Thallium
- Vanadium

Of these COPCs, benzo(g,h,i)perylene and phenanthrene were retained as COPCs because they do not have published screening levels.

Combined Surface and Subsurface Soil: As shown on Table 2.2, the following 21 analytes were detected at concentrations exceeding selected screening criteria in the OD Hill Area and are COPCs in combined surface and subsurface soil:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Benzo(a)pyrene
- Benzo(g,h,i)perylene
- N-Nitrosodipropylamine
- Phenanthrene
- Nitroglycerine
- Aroclor-1254
- Aluminum
- Antimony
- Arsenic
- Cadmium
- Chromium (total)
- Cobalt
- Copper
- Lead
- Manganese
- Mercury
- Silver
- Thallium
- Vanadium

Of these COPCs, benzo(g,h,i)perylene and phenanthrene were retained as COPCs because they do not have published screening levels. No subsurface soil samples were collected in the Kickout Area.

Groundwater: As shown on Table 2.4, the following 16 analytes were detected at concentrations exceeding the selected screening criteria and are COPCs in groundwater:

- Bis(2-Ethylhexyl)phthalate
- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium (total)
- Cobalt
- Copper
- Lead
- Manganese
- Mercury
- Nickel
- Thallium
- Vanadium

All analytes detected in groundwater have a published screening level.

Surface water: As shown on Table 2.5, the following 16 analytes were detected at concentrations exceeding the selected screening criteria and are COPCs in surface water:

- 1,2-Dichloroethane
- Copper

- RDX
- Aluminum
- Arsenic
- Barium
- Cadmium
- Chromium (total)
- Cobalt
- Cyanide
- Lead
- Manganese
- Mercury
- Nickel
- Vanadium
- Zinc

All analytes detected in surface water have a published screening level.

2.3 Exposure Assessment

The exposure assessment consists of three main steps:

1. Evaluation of exposure pathways and identification of receptors;
2. Estimation of EPCs; and
3. Estimation of human intake.

The risk assessment evaluates the reasonable maximum exposure (RME). The RME is designed to be a measure of “high-end” exposure. The most sensitive exposure parameters are identified and the maximum of several of these are used along with average values for the remaining parameters. Generally, per USEPA RAGS Part A (USEPA 1989), the concentration term used when estimating intake is the arithmetic average of the concentration that is contacted over the exposure duration. Although this concentration does not reflect the maximum concentration that could be contacted at any one time, it is regarded as a reasonable estimate of the concentration likely to be contacted over time. This is because in most situations, assuming long-term contact with the maximum concentration is not reasonable. Therefore, 95% upper confidence limits (UCL) on the mean concentrations are used to estimate exposure to contaminants when a sufficient number of samples are collected to reliably calculate a 95% UCL. This approach is intended to account for both uncertainty in the contaminant concentration and variability in the exposure parameters (such as exposure frequency or averaging time).

2.3.1 Conceptual Site Model

2.3.1.1 Evaluation of Exposure Pathways and Identification of Receptors

A conceptual site model (CSM) is used to qualitatively define the type of potential exposures to contaminants at or migrating from a site (i.e., to systematically evaluate the effect of chemicals in relevant media on potential receptors). The CSM describes onsite release points, affected physical media, types of contaminant transport and fate mechanisms that may be involved at the site, each group of potentially exposed populations or receptors, and how each receptor group may contact site-related contamination. The CSM is used to summarize existing site characterization data, including assumptions about land and groundwater use, and to complete the qualitative exposure pathway assessment.

An exposure pathway evaluation describes how a receptor could be exposed to COPCs at, or migrating from, a site. A potentially complete exposure pathway consists of four necessary elements:

- A source and mechanism of chemical release;

- An environmental transport medium;
- A point of potential contact with a receptor; and
- A feasible route of exposure at the exposure point.

The potentially complete exposure pathways and receptors at the OD Grounds are identified in this section. Consistent with RAGS (USEPA 1989), current and future land-use scenarios were considered for the site.

The site-specific CSM for potential human exposures is depicted in Figure 2.1 (OD Hill Area) and Figure 2.2 (Kickout Area) and is formulated according to applicable guidance, with the use of professional judgment and site-specific information on land use, water use, contaminant sources, release mechanisms, routes of migration, potential exposure points, potential routes of exposure, and potential receptor groups associated with the site. In accordance with the site-specific CSM, risk was quantitatively or qualitatively evaluated for the following potential human exposure scenarios:

- **Hypothetical Future Residents**: Although future residential land use is not anticipated, this scenario addresses the possibility for unrestricted land use in the future, including residential development with and without deep excavation and redistribution of soil. In some cases, residential development may require excavation, resulting in subsurface soil being redistributed at the surface. Therefore, future residential receptors will be evaluated for exposure to surface soil (0 to 2 feet bgs) and combined surface and subsurface soil (0 to 15 feet bgs). Future residents could include both children and adults. Hypothetical future residents can be exposed to constituents in soil through incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in air. Ingestion as drinking water and dermal contact (during showering/bathing) would be possible if a supply well were installed in the future. There are no volatile COPCs, so inhalation of volatiles from groundwater is not evaluated further. Potential exposure to surface water through incidental ingestion and dermal contact associated with wading may also occur.
- **Hypothetical Future Excavation/Construction Workers**: Hypothetical construction workers are assumed to be performing minor excavation activities, such as would be conducted during installation or repair of underground utilities or construction of building foundations. Therefore, hypothetical future excavation/construction workers can be exposed to constituents in soil to 15 feet bgs and shallow groundwater through incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in air. Ingestion of groundwater as a source of drinking water is not anticipated for the excavation/construction worker, but excavation/construction workers may be exposed to groundwater through incidental ingestion and dermal contact. Inhalation of volatiles emitted from groundwater to outdoor air is not expected, as none of the COPCs in groundwater are volatile. Potential exposure to surface water through incidental ingestion and dermal contact associated with wading may also occur.
- **Future Park Workers**: Future park workers are assumed to be exposed to soil through routine outdoor activities, including landscaping and grounds keeping activities. Therefore, future park workers can be exposed to constituents in soil to 2 feet bgs through incidental ingestion**,** dermal contact, and inhalation of ambient dust and vapors in air. Dermal contact and ingestion of groundwater as a source of drinking water would be possible if a supply well were to be installed in the future, and park workers may be exposed to groundwater through incidental ingestion and dermal contact. Inhalation of volatiles emitted from groundwater to outdoor air is not expected, as none of the COPCs in groundwater are volatile. Potential exposure to surface water through incidental ingestion and dermal contact associated with wading may also occur.

- **Current and Future Recreational Users**: Recreational users, including children and adults, are assumed to be exposed to soil through routine outdoor activities, such as hiking. It is not expected that recreational use of the land would include digging. Therefore, future recreational users can be exposed to constituents in soil to 2 feet bgs through incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in air. Dermal contact and ingestion of groundwater as a source of drinking water would be possible if a supply well were to be installed in the future, and recreational users may be exposed to groundwater through incidental ingestion and dermal contact. Inhalation of volatiles emitted from groundwater to outdoor air is not expected, as none of the COPCs in groundwater are volatile. Potential exposure to surface water through incidental ingestion and dermal contact associated with wading may also occur.

Exposure scenarios selected for evaluation are anticipated to account for the range of reasonably anticipated exposures under current and future conditions at SEDA. The scenarios selected are sufficiently conservative to adequately address other less common scenarios for soil, groundwater, and surface water.

There are no complete exposure pathways for sediment. Past remedial actions in Reeder Creek removed all sediment from the creek, and routine observations confirm that sediment has not returned to the area. Since drainage ditches located within the OD Hill Area are intermittent storm water conveyances, sediment samples (ditch soil) collected within the OD Hill Area are evaluated as surface soil.

The exposure assumptions used for estimating constituent intake are presented in Table 2.6 (soil), Table 2.7 (groundwater), and Table 2.8 (surface water). Estimated exposures to soil for hypothetical future residents were based on the assumption that a receptor would be exposed to soil for 350 days per year over a 6-year span as a child and a 20-year span as an adult. Estimated exposures for hypothetical excavation/construction workers were based on the assumption that an adult would be exposed to subsurface soil for 30 days per year, because excavation activities were assumed to be of one month duration over a one-year period. Estimated exposures for park workers were based on the USEPA assumption that an outdoor worker would contact surface soil for 225 work days per year over a 25-year period (USEPA 1991). Estimated exposures for future recreational users were based on the assumption that a recreational user would visit the site twice per month each year over a 6-year span as a child and a 20 year span as an adult.

Estimated exposures to groundwater for hypothetical future residents were based on the assumption that a receptor would contact groundwater for 350 days per year over a 6-year span as a child and a 20-year span as an adult. Estimated exposures for hypothetical excavation/construction workers were based on the assumption that an adult would contact groundwater for 30 days per year, because excavation activities were assumed to be of one month duration over a one-year period. Estimated exposures for park workers were based on the USEPA assumption that an outdoor worker would contact groundwater for 225 work days per year over a 25- year period (USEPA 1991). Estimated exposure for future recreational users were based on the assumption that a recreational user would visit the site twice per month each year over a 6-year span as a child and a 20-year span as an adult.

Estimated exposures to surface water for hypothetical future residents were based on the assumption that a receptor would contact surface water for 175 days per year over a 6-year span as a child and a 20-year span as an adult, because cold weather would preclude use of the creek for half of the year. Estimated exposures for hypothetical excavation/construction workers were based on the assumption that an adult would contact surface water for 30 days per year, because excavation activities were assumed to be of one month duration over a one-year period. Estimated exposures for park workers were based on the USEPA assumption that an outdoor worker would contact surface water for 113 work days per year over a 25-year period (USEPA 1991), because winter weather would preclude use of the creek for half the year. Estimated exposures for future recreational users were based on the assumption that a recreational user would visit the site twice per month each year over a 6-year span as a child and a 20-year span as an adult.

2.3.1.2 Exposure Area

An exposure area is the area over which sampling data are aggregated for estimation of risk. The size and location of the exposure area is generally commensurate with the assumed activity patterns of each specific receptor. The exposure area is consistent with the areas defined by the site-specific characterization of the nature and extent of contamination at source areas. The exposure areas evaluated in this risk assessment were defined considering the results of the source area investigation and activity patterns of the potential receptors being evaluated in the HHRA. For evaluation of soil, the OD Hill Area and the Kickout Area were evaluated as separate exposure areas. All groundwater wells were located within the OD Hill Area or the OB Area. Groundwater evaluation was conducted on a combined data set, including data from all wells, as well as data from each well individually. For surface water, three exposure areas were evaluated, the on-site drainage ditches in the OD Hill Area, the portion of Reeder Creek upstream of the Kickout Area, and the portion of Reeder Creek that passes through the Kickout Area and all downstream locations. Once Reeder Creek enters the Kickout Area, all locations downstream from that point are potentially affected by munitions activities at the OD Grounds and considered together.

2.3.2 Estimation of Exposure Point Concentrations

EPCs are the concentrations of chemicals in a given medium to which a receptor may be exposed at a specific location known as the "exposure point." EPCs are estimated based on medium-specific data and are used to calculate the risk due to exposure to a specific analyte. Each groundwater sampling location was considered an exposure point. Therefore, an EPC was identified as the maximum detected concentration of each COPC in each well.

For receptors potentially exposed to surface soil, the EPC is derived from soil samples with a starting sample depth from 0 - ≤ 2 feet bgs. For receptors potentially exposed to both surface and subsurface soil, the EPC was derived from soil samples with a starting sample depth from 0 - ≤ 15 feet bgs. For each data group (i.e., soil interval), EPCs for risk estimation were calculated using the best statistical estimate of an upper bound on the average exposure concentrations, in accordance with USEPA guidance for statistical analysis of monitoring data (USEPA 1989; 1992; 2002a). These guidance documents consider the 95 percent UCL on the mean concentration as a conservative upper bound estimate that is not likely to underestimate the mean concentration and most likely overestimates that concentration. EPCs were calculated for each COPC using the USEPA's statistical program ProUCL, version 5.0.00 (USEPA 2013b). This procedure identifies the statistical distribution type (normal, gamma, lognormal, or non-parametric) for each constituent within the defined exposure area and computes the corresponding 95% UCL for the identified distribution type.

"U" or "UJ" flagged data results were evaluated for the EPC calculations as follows:

- If an analyte is never detected in the dataset, the analyte was not evaluated further.
- If results indicate the analyte is detected in some, but not all, samples, the EPC was calculated using ProUCL, with all data entered with the sample specific detection limit.

EPCs for soil were selected as follows:

    - If the sample size is less than 6, the maximum detected concentration was selected as the EPC.
    - If the sample size is 6 or greater, the ProUCL-"suggested UCL to use" was selected as the EPC without further evaluation of scientific validity.

EPCs for risk estimation were calculated for each receptor type as follows:

- Soil EPCs for the resident (without excavation), park worker, and recreational user scenarios were calculated by aggregating analytical data collected from the exposure area for surface soil (0 - ≤ 2 feet bgs).
- Soil EPCs for the resident (with excavation) and excavation/construction worker scenarios were calculated by aggregating analytical data collected from the exposure area for combined surface and subsurface soil (0 - ≤ 15 feet bgs).
- Groundwater EPCs were the maximum detected concentration of each COPC. In addition, risk for each well was estimated using the maximum detected concentration from each well.
- Surface water EPCs were the maximum detected concentration of each COPC. Risk for each surface water exposure area was estimated using the maximum detected concentration from each area.

2.3.2.1 Exposure Point Concentration Results

Surface Soil in the OD Hill Area: A sufficient number of samples were present to calculate 95% UCLs for the following COPCs in surface soil: 2,4-dinitrotoluene, aluminum, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, silver, and vanadium. Benzo(a)pyrene, benzo(g,h,i)perylene, N-nitrosodipropylamine, phenanthrene, nitroglycerine, and Aroclor-1254 had an insufficient sample size to calculate a UCL, thus the maximum detected concentration was used as the EPC. The EPCs, summary statistics, and the statistical method used to calculate the EPC for surface soil, are presented in Table 2.9. The ProUCL input tables and outputs are included in Attachment A of this risk assessment.

Combined Surface and Subsurface Soil in the OD Hill Area: A sufficient number of samples were present to calculate 95% UCLs for the following COPCs in combined surface and subsurface soil: 2,4-dinitrotoluene, benzo(a)pyrene, benzo(g,h,i)perylene, phenanthrene, aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, silver, thallium, and vanadium. 2,6-dinitrotoluene, N-nitrosodipropylamine, nitroglycerine, and Aroclor-1254 had an insufficient sample size to calculate a UCL, thus the maximum detected concentration was used as the EPC. The EPCs, summary statistics, and the statistical method used to calculate the EPC for combined surface and subsurface soil are presented Table 2.10. The ProUCL input tables and outputs are included in Attachment A of this risk assessment.

Surface soil in the Kickout Area: A sufficient number of samples were present to calculate 95% UCLs for the following COPCs in surface soil: aluminum, arsenic, cadmium, chromium, cobalt, lead, manganese, mercury, and vanadium. Phenanthrene and MCPA had an insufficient sample size to calculate a UCL, thus the maximum detected concentration was used as the EPC. The EPCs, summary statistics, and the statistical method used to calculate the EPC for combined surface and subsurface soil are presented Table 2.11. The ProUCL input tables and outputs are included in Attachment A of this risk assessment.

Groundwater: Groundwater risk was first evaluated using maximum detected concentrations for each analyte, regardless of in which well that concentration was found. However, evaluation of risk for individual wells provides a more accurate representation of exposure, since potential future exposure would assume the presence of a supply well placed at a specific location on-site, drawing groundwater from a specific point. Therefore, groundwater risk was also calculated using the maximum detected concentration of each analyte in each well as the EPC. The maximum detected concentrations of all detected analytes in all wells combined and the maximum detected concentration from individual wells are presented in Table 2.12.

Surface Water: Surface water in the Reeder Creek flows to the north and northwest, on the perimeter of the OD Grounds. Additional surface water flows through drainage ditches through the OD Grounds to Reeder Creek. To determine the relative contribution of site-related chemicals to the surface water in Reeder Creek, the surface water samples in Reeder Creek upstream of the OD grounds, surface water samples in the drainage ditches through the OD Grounds, and surface water samples in Reeder Creek adjacent to the site and downstream of the site were evaluated separately. Therefore, the EPC was the maximum detected concentration from surface water samples collected within each of the three exposure areas, as shown in Table 2.13.

2.3.3 Estimation of Human Intake

The following equations were used to estimate human intake of COPCs in soil and groundwater. Supporting calculations are provided in Attachment B of this report.

2.3.3.1 Intake Equations for Ingestion of Soil

The following equation (USEPA 1989) was used to calculate the intake (expressed as milligrams [mg] per kilogram [kg] per day) associated with the incidental ingestion of carcinogenic and noncarcinogenic contaminants in soil:

$$Ingestion = \frac{C_S \times IRS \times 10^{-6} kg/mg \times EF \times ED}{AT \times BW \times 365 days/year} \quad (1)$$

The following age-weighted equation (USEPA 1989; 2013c) was used to calculate intake associated with incidental ingestion of carcinogenic contaminants in soil for the residential and recreational user exposure scenarios:

$$Intake = \frac{C_S \times IFS_{adj} \times EF \times 10^{-6} kg/mg}{AT \times 365 days/year} \quad (2)$$

where:

$$IFS_{adj} = \frac{ED_c \times IRS_c}{BW_c} + \frac{ED_a \times IRS_a}{BW_a} \quad (3)$$

where:

C_s = chemical concentration in soil (mg/kg)

IRS = soil ingestion factor [(mg-year)/(kg-day)]

IFS_{adj} = age-adjusted soil ingestion factor [(mg-year)/(kg-day)]

IRS_a = adult soil ingestion rate (mg/day)

IRS_c = child/adolescent soil ingestion rate (mg/day)

EF = exposure frequency (days/year)

ED_a = adult exposure duration (years)

ED_c = child/adolescent exposure duration (years)

BW_a = adult body weight (kg)

BW_c = child/adolescent body weight (kg)

AT = averaging time (years)

The exposure assumptions for estimating chemical intake from the ingestion of contaminants in soil are presented in Table 2.6.

2.3.3.2 Intake Equations for Dermal Contact with Soil

The following equations (USEPA 2004) were used to calculate the intake from dermal contact with carcinogenic and noncarcinogenic contaminants in soil:

$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT \times 365 days/year} \tag{4}$$

where:

$$DA_{event} = C_s \times AF \times ABS \times 10^{-6} kg/mg \tag{5}$$

The following age-weighted equation (USEPA 2004) was used to calculate the intake from dermal contact with carcinogenic contaminants in soil under the residential and recreational user exposure scenarios:

$$DAD = \frac{C_s \times SFS_{adj} \times ABS \times EF \times EV \times 10^{-6} kg/mg}{AT \times 365 days/year} \tag{6}$$

where:

$$SFS_{adj} = \frac{ED_C \times AF_c \times SA_c}{BW_c} + \frac{ED_a \times AF_a \times SA_a}{BW_a} \tag{7}$$

where:

DAD = dermally absorbed dose (mg/kg-day)

C_s = chemical concentration in soil (mg/kg)

ABS = absorption fraction (unitless)

SFS_{adj} = age-adjusted dermal contact factor [(mg-year)/(kg-event)]

SA_a = adult exposed skin surface area (cm^2)

SA_c = child/adolescent exposed skin surface area (cm^2)

AF_a = adult soil-to-skin adherence factor (mg/cm^2-event)

AF_c	=	child/adolescent soil-to-skin adherence factor (mg/cm^2-event)
EF	=	exposure frequency (days/year)
ED_a	=	adult exposure duration (years)
ED_c	=	child/adolescent exposure duration (years)
EV	=	event frequency (events/day)
BW_a	=	adult body weight (kg)
BW_c	=	child/adolescent body weight (kg)
AT	=	averaging time (years)

Exposure assumptions for estimating exposure from dermal contact with soil are presented in Table 2.6. Dermal absorption fractions were obtained from the dermal assessment guidance (USEPA 2004).

2.3.3.3 Equations for Inhalation of Ambient Dust or Vapors

The exposure concentrations for volatile/particulate COPCs in outdoor air, in $\mu g/m^3$, were estimated as follows (USEPA 2009a):

$$EC(air) = \frac{\mathrm{C_a} \times \mathrm{ET} \times \mathrm{EF} \times \mathrm{ED}}{\mathrm{AT} \times 365\mathrm{days/year}} \tag{8}$$

where:

C_a	= contaminant concentration in air (µg/cubic meter [m^3])
EC	= exposure concentration ($\mu g/m^3$)
ED	=exposure duration (years) = exposure duration, adult (ED_a) + exposure duration, child (ED_c)
EF	=exposure frequency (days/year)
ET	= exposure time as a fraction of the day spent at the site (unitless)
AT	= averaging time (years)

For exposure scenarios where a receptor would be exposed to ambient dust and vapors in air, the contaminant concentration in air, C_a ($\mu g/m^3$), was calculated using the following equation derived from USEPA RSL User's Guide (USEPA 2013c):

$$C_a = \mathrm{C_s} \times 1{,}000\mu\mathrm{g/mg} \times \left[\frac{1}{\mathrm{VF}} + \frac{1}{\mathrm{PEF}}\right] \tag{9}$$

For exposure scenarios where a receptor would be exposed to inorganic analytes in ambient dust particles in air, the contaminant concentration in air, C_a ($\mu g/m^3$), was calculated using the following equation derived from USEPA RSL User's Guide (USEPA 2013b):

$$C_a = \mathrm{C_s} \times \frac{1{,}000\mu\mathrm{g}}{\mathrm{mg}} \times \left(\frac{1}{\mathrm{PEF}}\right) \tag{10}$$

The volatilization factor (VF) was estimated using the following equation (USEPA 2002b; 2013c):

$$VF = {}^{Q}\!/_{C} \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4}\ {}^{m^2}\!/_{cm^2} \tag{11}$$

where:

$$D_A = \frac{\left[\left(\theta_a^{10/3} \times D_i \times H' + \theta_w^{10/3} \times D_w\right)/\, n^2\right]}{\rho_b \times K_d + \theta_w + \theta_a \times H'} \tag{12}$$

where:

VF	=	Chemical-specific volatilization factor (m^3/kg)
Q/C	=	Inverse of mean concentration at center of square source area (grams[g] per square meter per second [m^2-s] per kg/m^3)
D_A	=	Apparent diffusivity (cm^2 per second [s])
T	=	Exposure interval (s)
ρ_b	=	Dry soil bulk density (g/cm^3)
θ_a	=	Air-filled soil porosity (L_{air}/L_{soil}) = n-θ_w
θ_w	=	Water-filled soil porosity (L_{water}/L_{soil})
n	=	Total soil porosity (L_{pore}/L_{soil}) = 1- (ρ_b / ρ_s)
ρ_s	=	soil particle density (g/cm^3)
D_i	=	Diffusivity in air (cm^2/s)
H’	=	Henry’s law constant (unitless)
D_w	=	Diffusivity in water (cm^2/s)
K_d	=	Soil-water partition coefficient (cm^3/g) (= K_{OC} X f_{OC})
K_{OC}	=	Soil organic carbon-water partition coefficient (cm^3/g)
f_{OC}	=	Organic carbon content of soil (gram[s] per gram [g/g])
PEF	=	Particulate emission factor (m^3/kg)

The soil-to-air VF was used to define the relationship between the concentrations of COPCs in soil and the flux of volatilized COPCs to air. VFs were calculated using methods described in Soil Screening Guidance: User’s Guide (USEPA 1996a), Supplemental Guidance for Developing Soil Screening Levels (USEPA 2002b), and the RSL User’s Guide (USEPA 2013c). Calculation of VF involves use of site-specific, chemical-specific, and default factors. USEPA (1996a; 2002b) guidance provides default source concentration terms (called Q/C terms or values for the site-specific dispersion model) based on meteorological conditions specific to 29 locations throughout the country and the size of the contaminant source. Per USEPA (1996a), a Q/C value best representing the area’s size and meteorological conditions at the site is used in the VF calculation. For this site, the Q/C value is the default value provided by USEPA (2013c).

In addition, soil saturation must be considered when calculating the VF (USEPA 1996a). Soil saturation corresponds to the COPC concentration in soil at which the adsorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the COPC in soil may be present in free phase. Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is equal to or less than the soil saturation concentration. Soil saturation concentrations were calculated per USEPA (1996a; 2002b, 2013c) as follows below.

$$C_{sat} = \frac{S}{\rho_b} \times K_d \times \rho_b + \Theta_w + H' \times \Theta_a \tag{13}$$

where:

C_{sat}	=	soil saturation concentration (mg/kg)
S	=	solubility in water (mg/L-water)
ρ_b	=	dry soil bulk density (g/cm^3)
K_d	=	soil-water partition coefficient (cm^3/g) =K_{oc} x f_{oc}
K_{oc}	=	soil organic carbon/water partition coefficient (cm^3/g)
f_{oc}	=	fraction organic carbon in soil (g/g)
Θ_w	=	water-filled soil porosity (L_{water}/L_{soil})
H'	=	Henry's law constant (dimensionless)
Θ_a	=	air-filled soil porosity (L_{air}/L_{soil}), =n- Θ_w
n	=	total soil porosity (L_{pore}/L_{soil}), =1-($\rho_{b/}$ ρ_s)
ρ_s	=	soil particle density (g/cm^3)

If the soil COPC concentration is greater than the soil saturation concentration, the following equation was used to calculate the contaminant concentration in air, C_a (µg/m^3):

$$C_a = \left(\mathrm{C_s} \times \frac{1{,}000\mu\mathrm{g}}{\mathrm{mg}} \times \left(\frac{1}{\mathrm{PEF}}\right)\right) + \left(\mathrm{C_{sat}} \times \frac{1{,}000\mu\mathrm{g}}{\mathrm{mg}} \times \left(\frac{1}{\mathrm{VF}}\right)\right) \tag{14}$$

If the soil COPC concentration is less than or equal to the soil saturation concentration, the following equation was used to calculate the contaminant concentration in air, C_a (µg/m^3):

$$C_a = \mathrm{C_S} \times \frac{1{,}000\mu\mathrm{g}}{\mathrm{mg}} \times \left(\frac{1}{\mathrm{VF}} + \frac{1}{\mathrm{PEF}}\right) \tag{15}$$

where:

C_a	=	Contaminant concentration in air (µg/m^3)
C_s	=	COPC concentration in soil (mg/kg)
C_{sat}	=	soil saturation concentration (mg/kg)
VF	=	Chemical-specific volatilization factor (m^3/kg)
PEF	=	Particulate emission factor (m^3/kg)

The particulate emission factor (PEF) relates the concentration of the soil COPC to the concentration of dust particles in the air. This calculation addresses dust generated from open sources, which is termed "fugitive" because it is not discharged into the atmosphere in a confined flow. PEF calculations include the default Q/C term, as described above.

The PEF was estimated using the following equation (USEPA 2002b; 2013c):

$$PEF = {}^{Q}/_{C} \times \frac{3{,}600\ {}^{seconds}/_{hour}}{0.036 \times (1-V) \times \left({}^{U_m}/_{U_t}\right)^3 \times F(x)} \tag{16}$$

where:

			Default	Source
PEF	=	particulate emission factor (m^3/kg)	1.32 X 10^9	--
Q/C	=	inverse of mean concentration at center of square source area (g/m^2-s per kg/m^3)	90.80	USEPA 1996a (p. 32)
V	=	fraction of vegetative cover (unitless)	0.5 (50%)	USEPA 1996a (pg. 23)
U_m	=	mean annual wind speed (m/s)	4.69	USEPA 1996a (pg. 23)
U_t	=	equivalent threshold value of wind speed at 7 m (m/s)	11.32	USEPA 1996a (pg. 23)
F(x)	=	function dependent on U_m/U_t derived using Cowherd, et al. (1985) (unitless)	0.194	USEPA 1996a (pg. 23)

The soil COPC concentration is compared to the soil saturation concentration in Attachment B. As shown in Attachment B, the soil COPC concentration was less than the soil saturation concentration for all COPCs at each soil interval, within each soil exposure area. Therefore, Equation 14, above, was used to estimate the contaminant concentration in air. The exposure assumptions used to estimate exposure from inhalation of dust and vapors in ambient air are presented in Table 2.6.

2.3.3.4 Intake Equations for Ingestion of Groundwater or Surface Water

The following equation (USEPA 1989) was used to calculate the intake of carcinogenic and noncarcinogenic constituents associated with ingestion of groundwater or surface water:

$$Intake = \frac{C_w \times IRW \times EF \times ED}{AT \times BW \times 365 days/year} \tag{17}$$

The following age-weighted equation (USEPA 1989; 2013c) was used to calculate the intake of carcinogenic constituents associated with the ingestion of groundwater or surface water under the residential and recreational user exposure scenarios:

$$Intake = \frac{C_w \times IFW_{adj} \times EF}{AT \times 365 days/year} \tag{18}$$

where:

$$IFW_{adj} = \frac{ED_c \times IRW_c}{BW_c} + \frac{ED_a \times IRW_a}{BW_a} \tag{19}$$

where:

C_W = chemical concentration in groundwater milligrams per liter (mg/liter [L])

IFW_{adj} = age-adjusted water ingestion factor [(L-year)/(kg-day)]

IRW_a = adult groundwater ingestion rate (L/day)

IRW_c = child/adolescent groundwater ingestion rate (L/day)

EF = exposure frequency (days/year)

ED_a = adult exposure duration (years)

ED_c = child/adolescent exposure duration (years)

BW_a = adult body weight (kg)

BW_c = child/adolescent body weight (kg)

AT = averaging time (days)

Exposure assumptions for estimating chemical intake from ingestion of groundwater are presented in Table 2.7 and exposure assumptions for estimating chemical intake from ingestion of surface water are presented in Table 2.8.

2.3.3.5 Intake Equations for Dermal Contact with Groundwater or Surface Water

The following equation (USEPA 2004) was used to calculate the intake associated with dermal contact with carcinogenic and noncarcinogenic constituents in groundwater or surface water under the excavation/construction worker exposure scenario:

$$DAD = \frac{DA_{event} \times EV \times ED \times EF \times SA}{BW \times AT \times 365 days/year} \tag{20}$$

The following age-weighted equation, derived from Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment (USEPA 2004), was used to calculate the intake associated with dermal contact with carcinogenic constituents in groundwater or surface water under the residential and recreational user exposure scenarios:

$$DAD = \frac{DA_{event} \times SFW_{adj}}{AT \times 365 days/year} \tag{21}$$

where:

$$SFW_{adj} = \frac{EV_c \times ED_c \times EF \times SA_c}{BW_c} + \frac{EV_a \times ED_a \times EF \times SA_a}{BW_a} \tag{22}$$

where:

DAD = dermally absorbed dose (mg/kg-day)

DA_{event} = absorbed dose per event, calculated for inorganic and organic chemicals, as applicable, in accordance with USEPA 2004 (mg/cm^2-event) (see below)

SFW_{adj} = age-adjusted water dermal contact factor [(cm^2-event)/kg]

EF = exposure frequency (days/year)

ED_a = adult exposure duration (years)

ED_c = child/adolescent exposure duration (years)

EV_a = event frequency, adult (events/day)

EV_c = event frequency, child (events/day)

SA_a = adult exposed skin surface area (cm^2)

SA_c = child/adolescent exposed skin surface area (cm^2)

BW_a = adult body weight (kg)

BW_c = child/adolescent body weight (kg)

AT = averaging time (days)

The following equation (USEPA 2004) was used to calculate DA_{event} (mg/cm^2-event) for inorganic compounds:

$$DA_{event} = K_p \times C_w \times t_{event} \tag{23}$$

where:

DA_{event} = absorbed dose per event (mg/cm^2-event)

K_p = dermal permeability coefficient of compound in water (cm/hour)

C_w = chemical concentration in water (mg/cm^3)

t_{event} = event duration (hours/event)

The following equation (USEPA 2004) was used to calculate DA_{event} (mg/cm^2-event) for organic compounds:

If $t_{event} \leq t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}} \tag{24}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right] \tag{25}$$

where:

DA_{event} = absorbed dose per event (mg/cm^2-event)

FA	=	fraction absorbed water (dimensionless)
K_p	=	dermal permeability coefficient of compound in water (cm/hour)
C_w	=	chemical concentration in water (mg/cm^3)
τ_{event}	=	lag time per event (hour/event)
t_{event}	=	event duration (hours/event)
t*	=	time to reach steady-state (hour) = 2.4 τ_{event}
B	=	dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless)

Exposure assumptions used to estimate exposure from dermal contact with groundwater are presented in Table 2.7. The exposure assumptions used to estimate exposure from dermal contact with surface water are presented in Table 2.8.

2.4 Toxicity Assessment

In accordance with USEPA guidance (USEPA 2003a, 2013c), toxicity values (slope factors [SF], Inhalation unit risk [IUR], reference doses [RfD]), and reference concentrations [RfC] used in the risk assessment were obtained from the following hierarchy of sources:

1. USEPA's Integrated Risk Information System (IRIS) (USEPA 2014d).
2. The Provisional Peer-Reviewed Toxicity Values (PPRTV) derived by USEPA's Superfund Health Risk Technical Support Center (STSC) for the USEPA Superfund program (USEPA 2014e).
3. The Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (MRL) (ATSDR 2014).
4. The California Environmental Protection Agency (OEHHA) Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels (REL) from October 2013 and the Cancer Potency Values from July 21, 2009 with updates in 2011 for dioxin/furans and dioxin-like PCBs (OEHHA 2014).
5. Health Effects Assessment Summary Tables (HEAST) USEPA. Health Effects Assessment Summary Tables (HEAST) (USEPA 1997).
6. RSL Users Guide (USEPA 2014c).

Toxicity criteria used in the risk assessment are consistent with those presented by USEPA in the May 2014 RSL table (i.e., current at the time the first risk assessment was completed). The toxicity criteria in the USEPA RSL table were selected using the aforementioned hierarchy. Uncertainties associated with this approach are discussed in Section 2.5.5.4.

Chromium can exist in the environment as chromium(III) and chromium(VI). Analytical results presented in this report are for chromium(total) and do not distinguish between the different valence states. There are no toxicity criteria for chromium(total). Risk due to exposure to both chromium(III) and chromium(VI) was estimated using the chromium(III) and chromium(VI) toxicity data and the chromium(total) results.

USEPA has not developed toxicity values specific to the dermal absorption pathway. However, dermal toxicity values were derived from the oral toxicity values as described in USEPA's most recent dermal risk assessment guidance (USEPA 2004). Toxicity values provided by USEPA reflect administered-dose values; that is, they represent concentrations that will be protective following ingestion or inhalation. The dermal route of exposure, however, evaluates the toxicity of concentrations of chemicals in the blood (absorbed). Therefore, the absorbed-dose concentrations identified for dermal exposure must be compared to absorbed-dose toxicity values. Absorbed-dose toxicity values are derived by applying oral absorption factors to administered-dose toxicity values. Oral absorption factors used in the HHRA were obtained from Risk Assessment Guidance for Superfund, Part E (USEPA 2004).

Chemical-specific toxicity values used in the HHRA are shown in Table 2.14 (soil), Table 2.15 (groundwater), and Table 2.16 (surface water).

2.5 Risk Characterization

The final step in the risk assessment process is risk characterization. The purpose of the risk characterization step is to 1) review results from the exposure and toxicity assessments; 2) quantitatively estimate the potential for carcinogenic (i.e., risk) and noncarcinogenic (i.e., hazard) effects; and 3) assess and discuss uncertainties associated with each of the aforementioned steps. To characterize potential noncarcinogenic effects, estimated exposure concentrations of COPCs were compared with their respective toxicity values. To characterize potential carcinogenic effects, the incremental probability of an individual developing cancer over a lifetime was calculated from estimated exposure concentrations and chemical-specific dose/response information (i.e., carcinogenic toxicity factors). Cancer risk (for carcinogens) and HQ (for noncarcinogens) estimates were calculated as described below for each COPC.

Each COPC detected at a concentration greater than the selected COPC screening values was included in the cumulative risk calculations. However, metals detected below background were excluded from the cumulative risk calculations as detailed below in Section 2.5.1.

2.5.1 Noncancer Hazard Estimation

Potential health hazards associated with exposure to noncarcinogenic compounds were evaluated by calculating a HQ. The potential HQ was calculated as the ratio of the intake (via ingestion) or dermal absorbed dose (DAD) (via dermal contact) to the RfD_o or dermal reference dose (RfD_d), respectively, as follows (USEPA 1989):

$$HQ = Intake / RfD_o \tag{26}$$

$$HQ = DAD / RfD_d \tag{27}$$

where:

HQ = Noncancer hazard quotient (unitless)
Intake = Chronic daily ingestion averaged over a lifetime (mg/kg-day)
RfD_o = Oral reference dose (mg/kg-day)
DAD = Dermally absorbed dose (mg/kg-day)
RfD_d = Dermal reference dose (mg/kg-day)

For noncancer effects by inhalation exposure, the following equation was used (USEPA 2009a):

$$HQ_{inh} = EC\ (air) \Big/ \left(RfC\ x\ 1{,}000\ \frac{\mu g}{mg}\right) \tag{28}$$

where:

HQ_{inh} = Noncancer hazard quotient from inhalation (unitless)
EC (air) = Exposure concentration in air ($\mu g/m^3$)
RfC = Noncancer reference concentration (mg/m^3)

If the estimated daily intake for any single constituent is greater than its RfD or RfC, the HQ will exceed 1. An HQ that exceeds 1 indicates a potential for adverse health effects associated with exposure to that constituent.

The supporting calculations are provided in Attachment B of this report.

2.5.2 Cancer Risk Estimation

Individual cancer risk was calculated as the product of exposure (intake for ingestion and DAD for dermal contact) to a constituent (in mg/kg-day) and the SF (SF_o for ingestion and SF_d for dermal contact) for that constituent (in $mg/kg\text{-}day)^{-1}$, as follows (USEPA 1989):

$$Risk = Intake \ x \ SF_o \tag{29}$$

$$Risk = DAD \ x \ SF_d \tag{30}$$

where:

Risk = Excess lifetime cancer risk (unitless probability)
Intake = Chronic daily ingestion averaged over a lifetime (mg/kg-day)
SF_o = Oral cancer slope factor $(mg/kg\text{-}day)^{-1}$
DAD = Dermally absorbed dose (mg/kg-day)
SF_d = Dermal cancer slope factor $(mg/kg\text{-}day)^{-1}$

Inhalation risk is calculated by multiplying the exposure concentration by the IUR. Inhalation risk was estimated by using the following formula (USEPA 2009a):

$$Risk_{inh} = EC(air) \times IUR \tag{31}$$

where:

$Risk_{inh}$ = Excess lifetime cancer risk from inhalation (unitless probability)
EC (air) = Exposure concentration in air ($\mu g/m^3$)
IUR = Inhalation unit risk $(\mu g/m^3)^{-1}$

Each SF is accompanied by a weight-of-evidence classification that considers the available data for a constituent in order to evaluate the likelihood that the constituent is a potential human carcinogen. The evidence is characterized separately for studies in humans and studies in laboratory animals as sufficient, limited, inadequate, no data, or evidence of noncarcinogenicity. The USEPA recommends that cancer risk estimates should always be accompanied by a weight-of-evidence classification to indicate the strength of evidence that a constituent is a human carcinogen (USEPA 1989). For the purposes of this evaluation, the potential for unacceptable human health risk is identified when the multi-constituent aggregate risk for the direct-contact pathways exceeds an excess lifetime cancer risk (ELCR) of 1×10^{-5}. Supporting calculations are provided in Attachment B of this report.

2.5.3 Cumulative Risk

Each COPC detected at a concentration greater than the selected COPC screening values was included in the cumulative risk calculations. Cancer risk from exposure to multiple carcinogens and multiple pathways was assumed to be additive, based on the Guidelines for Carcinogen Risk Assessment (USEPA 2005). The following equation was used to calculate the total risk from exposure to multiple substances (USEPA 1989):

$$Risk_T = \sum Risk_i \tag{32}$$

where:

$Risk_T$ = Total Risk for multiple constituents per exposure pathway (unitless)
$Risk_i$ = Risk for the i^{th} constituent (unitless)

The following equation was used to calculate the cumulative risk (USEPA 1989):

$$\text{Cumulative Cancer Risk} = Risk_T\text{ (inhalation)} + Risk_T\text{ (dermal)} + Risk_T\text{ (ingestion)} \tag{33}$$

A hazard index (HI) is calculated to assess the potential for noncancer effects posed by more than one constituent. The HI approach assumes that simultaneous sub-threshold exposures to several constituents across all media and pathways of exposure could result in an adverse health effect. It also assumes that the magnitude of the adverse effect will be proportional to the sum of the ratios of the sub-threshold exposures to the acceptable exposure (the RfD or RfC). The HI is equal to the sum of the HQs, and was calculated as follows (USEPA 1989):

$$HI = \sum HQ_i \tag{34}$$

where:

HQ_i = Hazard quotient for the i^{th} constituent (unitless)

For the purposes of this evaluation, the potential for unacceptable human health risk is identified when the multi-constituent aggregate risk for the direct-contact pathways exceeds a noncancer HI of 1.

In cases where the total cumulative HI exceeds 1, target organs would be considered, since non-carcinogens that affect different target organs are not expected to have cumulative effects.

2.5.4 Risk Characterization Results

The primary objective of this HHRA was to quantitatively characterize the human health risk associated with current and reasonably expected future exposure to contaminated media at the OD Grounds. As discussed in Section 2.3.1.l, all potentially complete exposure pathways for the site were evaluated or assumed to be evaluated based on more protective exposure scenarios (e.g., the ingestion of groundwater as a source of drinking water is protective of incidental ingestion). The exposure pathways were outlined in Section 2.3.1.l and were also shown on the CSMs (Figure 2.1 and Figure 2.2). Site-specific carcinogenic risks and noncarcinogenic hazards were estimated for receptors, exposure pathways, and COPCs per the methods described previously in this report. Results of the risk characterization are presented in this section.

2.5.4.1 OD Hill Area

COPCs were identified at the OD Hill in surface soil, combined surface and subsurface soil, and groundwater. The following subsections present results of the risk characterization for the OD Hill Area.

2.5.4.1.1 Surface Soil Risk Characterization

To determine the risk/hazard associated with exposure to contaminants in surface soil, historical surface soil samples were evaluated. As described in Section 2.2.2 and shown on Table 2.1, a total of 18 constituents were identified as COPCs in surface soil at the OD Hill Area. EPCs for these COPCs used in the risk assessment are presented in Table 2.9.

The pathway specific and cumulative risks for surface soil are summarized by receptor in Tables 2.17 through 2.20.

2.5.4.1.1.1 Carcinogenic Risk

Hypothetical Future Resident

Cumulative carcinogenic risk for a hypothetical future resident, in the absence of excavation, is estimated to be 3×10^{-5} (Table 2.17), which is within USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the carcinogenic risk associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 7 x 10^{-5}, which is within USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the hypothetical future resident.

Hypothetical Future Excavation/Construction Worker

Cumulative carcinogenic risk for a hypothetical future excavation/construction worker is estimated to be 8×10^{-8} (Table 2.18), which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 2 x 10^{-7}, which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the hypothetical future excavation/construction worker.

Future Park Worker

The cumulative carcinogenic risk for a future park worker is estimated to be 6×10^{-6} (Table 2.19), which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Cumulative risk includes the evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 1 x 10^{-5}, which is within the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the future park worker.

Current and Future Recreational User

Cumulative carcinogenic risk for a current and future recreational user is estimated to be 2×10^{-6} (Table 2.20), which is within the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 4 x 10^{-6}, which is within the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the recreational user.

2.5.4.1.1.2 Noncarcinogenic Hazard

Hypothetical Future Child Resident

The HI for the hypothetical child future resident, in the absence of excavation, is estimated to be 6 (Table 2.17), which is greater than the hazard goal of 1. Cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation. COPCs driving the HI are Aroclor-1254 and cadmium. The critical effects associated with exposure to Aroclor-1254 are varied and include ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails, and decreased antibody (IgG and IgM) response to sheep erythrocytes. The critical effect associated with exposure to cadmium is significant proteinuria. Based on evaluation of the critical effects of the hazard drivers, the effects are not likely additive. However, the HIs of Aroclor-1254 and cadmium separately exceed the hazard goal of 1.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the hypothetical child future resident, the cumulative hazard associated with exposure all COPCs, including chromium(VI) in surface soil, is 6, which is greater than the hazard goal of 1.

Hypothetical Future Adult Resident

The HI for the hypothetical adult future resident, in the absence of excavation, is estimated to be 0.6 (Table 2.17), which is less than the hazard goal of 1.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the hypothetical adult future resident, the cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 0.6, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the hypothetical future adult resident.

Hypothetical Future Excavation/Construction Worker

The HI for the hypothetical future excavation/construction worker is estimated to be 0.1 (Table 2.18), which is less than the hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the hypothetical future construction/excavation worker, the cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is

0.1, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the hypothetical future excavation/construction worker.

Future Park Worker

The HI for a future park worker is estimated to be 0.4 (Table 2.19), which is less than the hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the hypothetical future park worker, the cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 0.4, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the future park worker.

Current and Future Child Recreational User

The HI for the current and future child recreational user is estimated to be 0.04 (Table 2.20), which is less than the hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the current and future child recreational user, the cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 0.04, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the child recreational user.

Hypothetical Future Adult Recreational User

The HI for the current and future adult resident is estimated to be 0.04 (Table 2.20), which is less than the hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the current and future adult recreational user, the cumulative hazard associated with exposure to all COPCs including chromium(VI) in surface soil is 0.04, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the adult recreational user.

2.5.4.2 Combined Surface and Subsurface Soil Risk Characterization

To determine the risk/hazard associated with exposure to contaminants in combined surface and subsurface soil in the OD Hill Area, historical surface and subsurface soil samples were evaluated. As described in Section 2.2.2, 20 constituents were identified as COPCs in the combined surface and subsurface soil.

The pathway-specific and cumulative risks for surface soil are summarized by receptor in Tables 2.21 and 2.22.

2.5.4.2.1 Carcinogenic Risk

Hypothetical Future Resident

The cumulative carcinogenic risk for a hypothetical future resident, following excavation and redistribution of soil, is estimated to be 6×10^{-5} (Table 2.21), which is within the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the cumulative carcinogenic risk associated with exposure to chromium(VI) was calculated. Risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 9 x 10^{-5}, which is within the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to combined surface and subsurface soil for the hypothetical future resident.

Hypothetical Future Excavation/Construction Worker

The cumulative carcinogenic risk for a hypothetical future excavation/construction worker is estimated to be 6×10^{-8} (Table 2.22), which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 10 x 10^{-8}, which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1 x 10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to combined surface and subsurface soil for the hypothetical future excavation/construction worker.

2.5.4.2.2 Noncarcinogenic Hazard

Hypothetical Future Child Resident

The HI for the hypothetical future child resident, following excavation and redistribution of soil, is estimated to be 5 (Table 2.21), which is greater than the hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation. The COPCs driving the HI are Aroclor-1254 and cadmium. The critical effects associated with exposure to Aroclor-1254 are varied and include ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails, and decreased antibody (IgG and IgM) response to sheep erythrocytes. The critical effect associated with exposure to cadmium is significant proteinuria. Based on evaluation of the critical effects of the hazard drivers, the effects are not likely additive. However, the HIs of Aroclor-1254 and cadmium separately exceed the hazard goal of 1.

Hypothetical Future Adult Resident

The HI for the hypothetical adult future resident, following excavation and redistribution of soil, is estimated to be 0.5 (Table 2.21), which is less than the hazard goal of 1. The cumulative hazard includes the evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the hypothetical adult future resident, the cumulative hazard associated with exposure all COPCs including chromium(VI) in surface soil is 0.7, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to combined surface and subsurface soil for the hypothetical future adult resident.

Hypothetical Future Excavation/Construction Worker

The HI for the hypothetical future excavation/construction worker is estimated to be 0.05 (Table 2.22), which is less than the hazard goal of 1. The cumulative hazard includes the evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. For the hypothetical future excavation/construction worker, the cumulative hazard associated with exposure all COPCs including chromium(VI) in surface soil is 0.06, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to combined surface and subsurface soil for the hypothetical future excavation/construction worker.

2.5.4.3 Groundwater Risk Characterization

To determine the risk/hazard associated with exposure to contaminants via exposure to groundwater, historical groundwater samples collected from monitoring wells at the site were evaluated. As described in Section 2.2.2, COPCs were identified through comparison of maximum detected concentrations observed in any well to screening values. Based on this comparison, 16 COPCs were identified (15 metals and one semivolatile organic compound [SVOC]). The calculated risks and hazards for the maximum detected concentration from any well onsite are provided in Tables 2.23 through 2.26. The calculated risks and hazards for each well were also evaluated to provide a spatial representation of the risks/hazards within the exposure area. Results of this spatial risk characterization analysis are provided in Tables 2.27 through 2.58 and presented on Figures 2.3 through 2.5. A summary of the carcinogenic risk and noncarcinogenic hazards for each receptor and each well is presented in Table 2.59.

2.5.4.3.1 Carcinogenic Risk

Hypothetical Future Resident

Cumulative carcinogenic risks for all COPCs, including chromium(III) to hypothetical future residents, including children and adults, range from 2×10^{-6} to 2×10^{-4} (Table 2.59). The risk estimate for hypothetical future residents is greater than the upper end of the cumulative carcinogenic risk goal of 1×10^{-4} in one well, MW45-4. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The primary contributor to this risk estimate was arsenic. However, the maximum detected arsenic concentration at the site (9.5 µg/L) is less than the promulgated maximum contaminant level (MCL) of 10 µg/L, a concentration allowed in potable water supplies.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. The cumulative carcinogenic risks for all COPCs, including chromium(VI) to hypothetical future residents, including children and adults, range from 2×10^{-6} to 1×10^{-3} (Table 2.59). The risk estimate for hypothetical future residents, if chromium(VI) is present, is greater than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in three wells; MW4, MW45-3, and MW45-4. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Primary contributors to this risk estimate were arsenic and chromium(VI). However, the maximum detected arsenic concentration at the site (9.5 µg/L) is less than the promulgated MCL of 10 µg/L, a concentration allowed in potable water supplies, and chromium(VI) is not expected to be present at the site based on past munitions-related activities.

Hypothetical Future Construction/Excavation Worker

Cumulative carcinogenic risks for all COPCs, including chromium(III) to hypothetical future construction/excavation workers range from 2×10^{-10} to 2×10^{-8} (Table 2.59). The risk estimate for hypothetical future construction/excavation workers is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in all wells. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via incidental ingestion and dermal contact. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate, there are no unacceptable risks anticipated for construction/excavation workers who may come into contact with groundwater at the site.

While the presence of chromium(VI) is not expected, the carcinogenic risk associated with exposure to chromium(VI) was calculated. The cumulative carcinogenic risks for all COPCs, including chromium(VI) to hypothetical future construction/excavation workers range from 2×10^{-10} to 1×10^{-7} (Table 2.59). The risk estimate for hypothetical future construction/excavation workers is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in all wells. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via incidental ingestion and dermal contact. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate there are no unacceptable risks anticipated for construction/excavation workers who may come into contact with groundwater at the site.

Future Park Worker

Cumulative carcinogenic risks for all COPCs including chromium(III) to future park workers range from 3×10^{-6} to 1×10^{-4} (Table 2.59). The risk estimate for future park workers is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in all wells. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate there are no unacceptable risks anticipated for future park workers who may come into contact with groundwater at the site.

While the presence of chromium(VI) is not expected, the carcinogenic risk associated with exposure to chromium(VI) was calculated. The cumulative carcinogenic risks for all COPCs, including chromium(VI) to future park workers range from 1×10^{-6} to 5×10^{-4} (Table 2.59). The risk estimate for future park workers, if chromium(VI) is present, is greater than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in three wells; MW4, MW45-3, and MW45-4. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Primary contributors to this risk estimate were arsenic and chromium(VI). However, the maximum detected arsenic concentration at the site (9.5 µg/L) is less than the promulgated MCL of 10 µg/L, a concentration allowed in potable water supplies, and chromium(VI) is not expected to be present at the site based on past munitions-related activities.

Current and Future Recreational User

Cumulative carcinogenic risks to hypothetical current and future recreational users range from 1 x 10^{-7} to 1 x 10^{-5} (Table 2.59). The risk estimate for current and future recreational users is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in all wells. Current recreational users of the site are not anticipated to come into contact with groundwater. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via incidental ingestion and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate there are no unacceptable risks anticipated for current and future recreational users who may come into contact with groundwater at the site.

While the presence of chromium(VI) is not expected, the carcinogenic risk associated with exposure to chromium(VI) was calculated. The cumulative carcinogenic risks for all COPCs, including chromium(VI) to current and future recreational users range from 2 x 10^{-7} to 6 x 10^{-5} (Table 2.59). The risk estimate for current and future recreational users, if chromium(VI) is present, is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4} in all wells. The risk estimate includes evaluation of risk associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate there are no unacceptable risks anticipated for current and future recreational users who may come into contact with groundwater at the site.

2.5.4.3.2 Noncarcinogenic Hazard

Hypothetical Future Resident

The cumulative noncarcinogenic HIs for all COPCs, including chromium(III) for hypothetical future residents range from 4 to 51 for children and 2 to 30 for adults (Table 2.59), with the greatest HI being found in monitoring well MW45-4. These HIs are greater than the target HI of 1 for all wells. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The main contributors to the HIs greater than 1 were thallium, cobalt, manganese, aluminum, and arsenic. Since each of these constituents has an individual HQ greater than 1, evaluation of critical toxic endpoints and target organs was not conducted.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium (VI) was calculated. The cumulative noncarcinogenic HIs, if chromium(VI) is present, for hypothetical future residents range from 4 to 54 for children and 2 to 32 for adults (Table 2.59), with the greatest HI being found in monitoring well MW45-4. These HIs are greater than the target HI of 1 for all wells. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The main contributors to the HIs greater than 1 were thallium, cobalt, manganese, aluminum, and arsenic. Since each of these constituents has an individual HQ greater than 1, evaluation of critical toxic endpoints and target organs was not conducted.

Hypothetical Future Construction/Excavation Worker

Cumulative noncarcinogenic HIs for all COPCs, including chromium(III) for hypothetical future construction/excavation workers range from 0.009 to 0.1 (Table 2.59). The HI is less than the target HI of 1 in all wells. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via incidental ingestion and dermal contact, should groundwater be encountered during excavation activities. Inhalation of volatiles emitted from groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate there are no unacceptable hazards anticipated for hypothetical future construction workers who may come into contact with groundwater at the site.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. The cumulative noncarcinogenic HIs, if chromium(VI) is present, for hypothetical future construction/excavation workers range from 0.009 to 0.2 (Table 2.59). The HI is less than the target hazard index of 1 in all wells. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via incidental ingestion and dermal contact, should groundwater be encountered during excavation activities. Inhalation of volatiles emitted from groundwater was not evaluated, as none of the COPCs are volatile. Based on results of this risk estimate there are no unacceptable hazards anticipated for hypothetical future construction workers who may come into contact with groundwater at the site.

Future Park Worker

Cumulative noncarcinogenic HIs for future park workers range from 1 to 19 (Table 2.59), with the greatest HI being found in monitoring well MW45-4. These HIs are greater than or equal to the target hazard index of 1 for all wells. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The main contributors to the HIs greater than 1 were thallium, cobalt, manganese, aluminum, and arsenic. Since each of these constituents has an individual HQ greater than 1, evaluation of critical toxic endpoints and target organs was not conducted.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. The cumulative noncarcinogenic HIs, if chromium(VI) is present, for future park workers range from 1 to 20 (Table 2.59), with the greatest HI being found in monitoring well MW45-4. These HIs are greater than the target hazard index of 1 for all wells. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The main contributors to the HIs greater than 1 were thallium, cobalt, manganese, aluminum, and arsenic. Since each of these constituents has an individual HQ greater than 1, evaluation of critical toxic endpoints and target organs was not conducted.

Current and Future Recreational User

Cumulative noncarcinogenic HIs for all COPCs, including chromium(III) for current and future recreational users range from 0.2 to 3 for children and 0.1 to 2 for adults (Table 2.59), with the greatest HI being found in monitoring well MW45-4. These HIs are greater than the target HI of 1 in well MW45-4. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The main contributors to the HIs greater than 1 were thallium and cobalt. Since each of these constituents has an individual HQ greater than 1, evaluation of critical toxic endpoints and target organs was not conducted.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. The cumulative noncarcinogenic HIs, if chromium(VI) is present for current and future recreational users range from 0.2 to 5 for children and 0.1 to 2 for adults (Table 2.59), with the greatest HI being found in monitoring well MW45-4. These HIs are greater than the target HI of 1 in well MW45-4. The hazard estimate includes evaluation of hazards associated with exposure to contaminants in groundwater via ingestion as drinking water and dermal contact, should groundwater be used as a potable water supply. Inhalation of volatiles emitted from potable groundwater was not evaluated, as none of the COPCs are volatile. The main contributors to the HIs greater than 1 were thallium and cobalt. Since each of these constituents has an individual HQ greater than 1, evaluation of critical toxic endpoints and target organs was not conducted.

2.5.4.4 Evaluation of Lead Hazards

Evaluation of the health hazards associated with exposure to lead in environmental media consists of evaluating a different toxic endpoint than that associated with carcinogens and other noncarcinogens. Lead exposure is evaluated based on the potential to increase blood lead levels above a certain threshold. Currently USEPA establishes that threshold as 10 µg/dL. There are two models the USEPA recommends for evaluating the potential toxicity of lead, the adult lead model (ALM) and the IEUBK model.

Since the most sensitive adult receptor is an exposed pregnant adult, the ALM is used to determine the potential for unacceptable fetal blood lead levels following the mother's exposure to lead-contaminated soil. Results of the ALM for surface soil are presented in Table 2.60, while results of the ALM for subsurface soil are presented in Table 2.61. As shown in the tables, exposure to lead in surface or subsurface soil is not expected to elevate fetal blood lead levels above the threshold of 10 µg/dL, based on the 95% UCL on the mean soil lead concentration.

The IEUBK evaluates the potential for child exposure to result in blood lead levels greater than the threshold of 10 µg/dL. To do so, it evaluates lead exposure from all potential sources, including soil, water, diet, and air. To evaluate the potential lead concentrations observed in soil, groundwater, and surface water at the OD Grounds to result in elevated blood lead levels in children that may be present on site, the IEUBK model was run using the 95% UCL on the mean lead concentrations for surface soil, the concentration for combined surface and subsurface soil, the concentration for each monitoring well, and the concentration for surface water at the site. Output of the IEUBK model is presented in Attachment C. As shown in Table 2.62, exposure to lead in soil and groundwater by hypothetical future child residents results in a predicted blood lead level greater than 10 µg/dL, in greater than 5% of the exposed children, in only MW45-4, the well with the highest observed lead concentration.

2.5.4.5 Kickout Area

COPCs were identified at the Kickout Area in surface soil. The following subsections present results of the risk characterization for the Kickout Area.

2.5.4.5.1 Carcinogenic Risk

Hypothetical Future Resident

The cumulative carcinogenic risk for a hypothetical future resident, in the absence of excavation, is estimated to be 7×10^{-7} (Table 2.63), which is less than USEPA's acceptable carcinogenic risk range of 1×10^{-4} to $1 \text{ x } 10^{-6}$. The cumulative risk includes evaluation of risk associated with chromium(III).

Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 2×10^{-5}, which is within the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the hypothetical future resident.

Hypothetical Future Excavation/Construction Worker

Cumulative carcinogenic risk for a hypothetical future excavation/construction worker is estimated to be 2×10^{-8} (Table 2.64), which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. The cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface soil is 4×10^{-8}, which is less than the USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the hypothetical future excavation/construction worker.

Future Park Worker

The cumulative carcinogenic risk for a future park worker is estimated to be 3×10^{-6} (Table 2.65), which is within USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. Cumulative risk includes evaluation of risk associated with chromium(III). Risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium(VI) was calculated. The cumulative risk associated with exposure to all COPCs including chromium(VI) in surface soil is 7×10^{-6}, which is within USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the future park worker.

Current and Future Recreational User

The cumulative carcinogenic risk for current and future recreational user is estimated to be 1×10^{-6} (Table 2.66), which is within USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. The cumulative risk includes the evaluation of risk associated with chromium(III). The risk includes evaluation of risk associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, carcinogenic risk associated with exposure to chromium (VI) was calculated. The cumulative risk associated with exposure to all COPCs including chromium(VI) in surface soil is 3×10^{-6}, which is within USEPA's acceptable carcinogenic risk range of 1×10^{-4} to 1×10^{-6}. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risks associated with exposure to surface soil for the future recreational user.

2.5.4.5.2 Noncarcinogenic Hazard

Hypothetical Future Resident

The HI for the hypothetical future resident, in the absence of excavation, is estimated to be 3 for a child resident and 0.3 for an adult resident (Table 2.63), which is greater than the hazard goal of 1 for the child resident, and less than the hazard goal of 1 for the adult resident. Cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation. The COPC driving the HI is cobalt. Critical effects associated with exposure to cobalt are respiratory, including decreased pulmonary function, asthma, interstitial lung disease, wheezing, and dyspnea.

While the presence of chromium(VI) is not expected, noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. Cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 3 for the child resident, and 0.3 for the adult resident, which is greater than the cumulative risk goal of 1 for the child resident, and less than the cumulative risk goal of 1 for the adult resident. The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation. The COPC driving the hazard index is cobalt. Critical effects associated with exposure to cobalt are respiratory, including decreased pulmonary function, asthma, interstitial lung disease, wheezing, and dyspnea.

Hypothetical Future Excavation/Construction Worker

The HI for the hypothetical future excavation/construction worker is estimated to be 0.03 (Table 2.64), which is less than the hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. The cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 0.03 for the hypothetical future excavation/construction worker, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the hypothetical future excavation/construction worker. The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

Future Park Worker

The HI for a future park worker is estimated to be 0.2 (Table 2.65), which is less than hazard goal of 1. The cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. The cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 0.2 for the future park worker, which is less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the future park worker. The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

Current and Future Recreational User

The HI for the current and future recreational user is estimated to be 0.00002 for a child recreational user, and 0.000002 for an adult recreational user (Table 2.66), which is less than the hazard goal of 1. Cumulative hazard includes evaluation of risk associated with chromium(III). The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

While the presence of chromium(VI) is not expected, the noncarcinogenic hazard associated with exposure to chromium(VI) was calculated. The cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface soil is 0.008 for the current and future child recreational user, and 0.0008 for the current and future adult recreational user, both of which are less than the hazard goal of 1. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface soil for the recreational user. The HI includes evaluation of hazards associated with exposure to contaminants in surface soil via ingestion, dermal contact, and inhalation.

2.5.4.6 Surface Water Risk Characterization

To determine the risk/hazard associated with exposure to contaminants in surface water, historical surface water samples collected from drainage ditches within the OD Hill Area and from Reeder Creek were evaluated. As described in Section 2.2.2, COPCs were identified through comparison of maximum detected concentrations observed in any surface water sample to screening values. Based on this comparison, 16 COPCs were identified (one SVOC, one explosive, and 14 metals). Three exposure areas were identified; the on-site drainage ditches, the Reeder Creek samples upstream of the OD Grounds, and the Reeder Creek samples within and downstream of the OD Grounds, and the calculated risks and hazards for each of three areas were evaluated. Results of this risk characterization analysis are provided in Tables 2.67 through 2.78. A summary of the carcinogenic risk and nonarcinogenic hazards for each receptor and each surface water exposure area is presented in Table 2.79.

2.5.4.6.1 Reeder Creek – Upstream Samples

Results of the carcinogenic and noncarcinogenic risk/hazard assessments for the Reeder Creek – Upstream samples are presented in Tables 2.67 through 2.70. There were no carcinogenic COPCs identified in the Reeder Creek – Upstream samples. Therefore, no carcinogenic risk assessment was performed, and there is no anticipated carcinogenic risk associated with exposure to Reeder Creek upstream of the OD Grounds. As summarized in Table 2.79, noncarcinogenic hazards calculated using the upstream samples ranged from 0.003 for the future park worker to 0.09 for the hypothetical future child resident. Chromium(total) was not detected in any samples from the upstream data set; therefore, only one risk estimate is presented. Based on the exposure scenarios evaluated in this HHRA, there are no unacceptable hazards associated with exposure to surface water upstream of the OD Grounds for any receptor.

2.5.4.6.2 On-Site Drainage Ditches

Results of the carcinogenic and noncarcinogenic risk/hazard assessments for the On-site Drainage Ditches are presented in Tables 2.71 through 2.74. As summarized in Table 2.79, the carcinogenic risk for exposure to surface water ranged from 2×10^{-9} to 5×10^{-7}, which is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4}. Cumulative risk includes evaluation of risk associated with chromium(III). As summarized in Table 2.79, noncarcinogenic hazards calculated using samples from the On-site Drainage Ditches ranged from 0.03 for the future park worker to 0.6 for the hypothetical future child resident. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risk/hazards associated with exposure to surface water upstream of the OD Grounds for any receptor.

While the presence of chromium(VI) is not expected, the carcinogenic risk/hazard associated with exposure to chromium(VI) was calculated. Cumulative risk associated with exposure to all COPCs, including chromium(VI) in surface water ranges from 3×10^{-7} for the hypothetical excavation/construction worker to 8×10^{-5} for the hypothetical future resident. The cumulative carcinogenic risk for the on-site drainage ditches, exposure of hypothetical future residents to surface water is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4}. The cumulative hazard associated with exposure to all COPCs, including chromium(VI) in surface water using the on-site drainage ditches ranged from 0.03 for the future park worker to 0.9 for the hypothetical future child resident. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risk/hazards associated with exposure to surface in the on-site drainage ditches for any receptor.

2.5.4.63.3 Reeder Creek – On-Site and Downstream Samples

Results of the carcinogenic and noncarcinogenic risk/hazard assessments for the Reeder Creek – Downstream samples are presented in Tables 2.75 through 2.78. As summarized in Table 2.79, the carcinogenic risk for exposure to surface water ranged from7×10^{-9} to 6×10^{-8}, which is less than the upper end of the acceptable carcinogenic risk range of 1×10^{-4}. Chromium(total) was not detected in any samples from the upstream data set; therefore, only one risk estimate is presented. As summarized in Table 2.79, noncarcinogenic hazards calculated using the Reeder Creek - Downstream samples ranged from 0.003 for the hypothetical construction/excavation worker to 0.7 for the hypothetical future child resident. Therefore, based on the exposure scenarios evaluated in this HHRA, there are no unacceptable risk/hazards associated with exposure to surface water in Reeder Creek on-site or downstream of the OD Grounds for any receptor.

2.5.5 Risk Assessment Uncertainties

All HHRAs involve use of assumptions, professional judgments, and imperfect data to varying degrees, which result in uncertainty in the final estimates of risk. Risk assessments in general are often based on conservative assumptions and scenarios. Uncertainty can be introduced into a health risk assessment at every step of the process outlined in this document. Uncertainties are present in a risk assessment because it requires integration of the following:

- Release of constituents into the environment, and the areal and vertical distribution of these materials in soil and groundwater;
- Fate and transport of constituents in a variety of different and variable environments by processes that are often poorly understood or too complex to quantify accurately;
- Potential for adverse health effects in humans based on extrapolations from animal studies; and
- Probability of adverse effects in a human population that is highly variable with respect to genetics, age, activity level, and lifestyle.

This section qualitatively describes the inherent and site-specific uncertainties of the assessments process.

2.5.5.1 Uncertainty in Data Collection and Evaluation

Analysis of uncertainties focuses on determining whether the available data are representative of contaminant concentrations and site conditions, and whether features of sampling, analyses, or statistical treatment of the data result in an over- or underestimation of potential risk.

Historical samples were collected from areas expected to be contaminated based on the understanding of past site activities; it is unlikely chemicals were present at health-significant levels and not detected in at least one sample.

Constituents detected at the site were retained for the risk assessment regardless of how frequently they were detected. USEPA's ProUCL 5.0.00 calculates UCLs for datasets with small sample sizes to accommodate the Incremental Sampling Method (USEPA 2013f). Because the soil samples collected were collected as discrete samples, not all UCLs calculated or suggested by ProUCL are appropriate for use in the risk calculations. Parametric and non-parametric methods (i.e., Student's-t and KM [Chebyshev]) were used to determine the 95% UCL for analytes with six or more samples. For analytes with six samples or less, the maximum detected concentration was used as the exposure point concentration. The use of the maximum detected concentration introduces uncertainty into the risk assessment, since use of one analytical result likely does not accurately represent the concentration of the constituent in the volume of soil or water being evaluated. In cases where the analyte is infrequently detected, the use of the maximum concentration will likely overestimate the actual EPC, resulting in an overestimate of the risk. In cases with few total samples, the use of the maximum detected concentration can either over- or underestimate the exposure concentration depending on distribution of the actual concentrations in the medium of concern.

Constituents that were never detected in any samples were eliminated from the risk assessment. It is possible that some constituents eliminated from consideration in the risk assessment may have actually been present in samples at concentrations lower than the reporting limit. If constituents eliminated from the risk assessment were actually present in the environmental medium, the cumulative risk could be underestimated. Constituents detected at concentrations less than the selected screening criteria were eliminated from the risk assessment. It is possible that some of these constituents may have been present at greater concentrations in areas that were not sampled, thus underestimating the potential exposure concentrations. However, the sampling plan attempted to reduce this uncertainty through the use of a consistent analytical approach as well as a biased sampling approach. Since samples were collected from areas identified in the CSM as areas most likely to be contaminated based on the understanding of past site activities, it is unlikely any constituents were present at health-significant levels and not detected.

Steady-state conditions (i.e., the observed concentrations remain the same in the environmental media for the foreseeable future) were assumed for evaluation of potential future exposures. The assumption of steady-state conditions may tend to overestimate long-term exposure and health risk because contaminant concentrations may decline over time due to natural dissipation processes (e.g., biological and chemical degradation) or dilution through transport processes. In some cases, depending on the contaminant and or the release mechanisms involved, steady-state assumptions could potentially underestimate risk (e.g., breakdown products that are more toxic than the parent compound or a continuous source contributing to contamination in another medium). Due to the age of the data used in this risk assessment, these uncertainties may be accentuated.

2.5.5.2 Uncertainty in Exposure Assessment

Risk assessment estimates are conditional on actual and potential exposure pathways identified at the site. If exposure does not occur, no risks are present. Furthermore, the risk assessment process does not factor in the probability of exposure occurring. For example, there may not be a reason for a construction worker to excavate in a contaminated area, as future development is hypothetical. Additionally, an uncertainty associated with the estimates of future residential risk is that future residential development of the site is also unlikely.

Current land uses and characterization of the site's current physical setting provided the basis for predicting future land use at and in the vicinity of the site. The assumption of steady-state conditions was also used in predicting future contaminant concentrations. As will be discussed in the uncertainty section, this assumption tends to overestimate potential future exposure levels because concentrations of chemicals may decline with time.

There is also some concern as to how well an exposure scenario approximates the actual conditions that a receptor may be exposed to at a given site. Potential human exposures could deviate from those used in the risk assessment through differences in exposure frequency, contact rates, exposure durations, body weight, and life span. Each factor has a degree of uncertainty associated with it that could over- or underestimate risk.

Evaluation of risk for residential settings includes calculation of the risk to children. Other sensitive subpopulations such as elderly people, pregnant or nursing women, and people with chronic illnesses were not specifically evaluated in this risk assessment. These subpopulations may be more sensitive to certain chemical exposures. However, USEPA generally considers sensitive subpopulations when developing toxicity factors. Whenever possible, exposure assumptions were made to protect sensitive subpopulations. Additionally, there are no daycare or school facilities, healthcare facilities, nursing homes, retirement communities, or residential areas with children onsite currently onsite.

Risks and hazards associated with inhalation of COPCs in surface water were not calculated. There is not a scenario where a significant exposure would result from inhalation of contaminants in surface water. Elimination of this pathway from further evaluation may underestimate the cumulative risk to receptors exposed to surface water.

2.5.5.3 Uncertainty in Toxicity Assessment

Some uncertainty is also inherent in the toxicity values used in the risk assessment. Carcinogenic slope factors and route-specific values were derived only for compounds shown to cause an increased incidence of tumors in either human or animal studies. This dose-response curve is then assumed to be linear at low doses (e.g., those found in situations of environmental contamination) and is used to predict tumor incidence at low exposure levels. When an animal study is used, the final SF is adjusted to account for extrapolation of animal data to humans. If the studies used to derive the SF were conducted for less than the life span of the test organism, the final SF was also adjusted to reflect risk associated with lifetime exposure.

The SF is generally a 95% UCL of the probability of a response based on experimental animal data in the multistage model. This means the site-specific constituent risk is not likely to exceed the risk estimate derived through the model and is likely to be less than the predicted risk.

The chronic RfD for a compound is based on studies where either human or animal populations were exposed to a given compound by a given route of exposure for a major portion of the life span (as a USEPA guideline, seven years to a lifetime; USEPA 1989). RfDs are derived by determining dose-specific effect levels from available quantitative studies and applying uncertainty factors to the most appropriate effect level to determine an RfD for humans. Uncertainty factors are generally applied as multiples of 10 to represent specific areas of uncertainty in the data. Typically, an uncertainty factor of 100 to 1,000 is used in the professional judgment of uncertainties. General uncertainties in the derivation of RfDs may be associated with factors such as (1) variations in the general population (to protect sensitive receptors), (2) extrapolation of animal data to humans, (3) use of a subchronic study versus a chronic study to determine the no -observed adverse effect level (NOAEL), or (4) use of a lowest-observed-adverse-effect level (LOAEL) versus a NOAEL. Both the uncertainty and modifying factors are conservative in nature and tend to overestimate risk.

Although the most current toxicity values assigned by USEPA are used in the risk assessment, these values may not be available for all compounds. The toxicity classification of a chemical may be under review or not available. If data are lacking, the chemical may not be accounted for in the estimates of potential risk.

Site-specific valence-specific data for chromium was unavailable and toxicity criteria are not available for chromium(total). Therefore, the risk due to exposure to both chromium(III) and chromium(VI) was estimated using the chromium(III) and chromium(VI) toxicity data and chromium(total) results. Risks were estimated for all the COPCs and either chromium(III) or chromium(VI), as presented in Attachment B. Chromium(VI) is less likely to be present as a result of former military activities onsite. Chromium(III) is associated only with noncarcinogenic effects, while chromium(VI) is associated with both carcinogenic and noncarcinogenic effects. Assuming one valence state over the other may under- or over- estimate risk.

2.5.5.4 Uncertainty in Estimating Chemical Risk

The expression of potential risk associated with contaminants detected at the site is a result of the combined steps of data evaluation, exposure assessment, and toxicity assessment. This combination can magnify the uncertainties present in these steps of the risk assessment process.

Groundwater onsite is not currently used as a drinking water resource. There are no current residents onsite. Estimates for carcinogenic risk to hypothetical future residents exceed USEPA's acceptable carcinogenic risk range of 1×10^{-4} to $1 \text{ x } 10^{-6}$ in one groundwater well (MW45-4). The main contribution to the carcinogenic risk for these receptors is due to the estimated risk of ingestion of groundwater. Estimates for noncarcinogenic hazard to hypothetical future residents (child and adult), future park workers, and current and future recreational users (child and adult) exceed the HI of 1. The main contributor to noncarcinogenic hazard for these receptors is due to the estimated hazard associated with ingestion of groundwater; therefore, there may be an unacceptable risk/hazard to human health if groundwater were to be used in the future as a drinking water resource.

Additional uncertainties are incorporated into the risk assessment when exposures to several substances are summed. Exposure to multiple chemicals may result in interactions between the chemicals in ways that may not be predictable. The assumption is that exposure to multiple chemicals is additive, that is, the carcinogenic risk or hazard quotient for each constituent is simply added together to estimate the cumulative risk or hazard. However, in reality some constituents may produce a synergistic effect, where the risk associated with exposure to these chemicals is actually greater than the sum of the carcinogenic risk or hazard quotients. In such a case, the risk assessment will underestimate the risk. In other cases, some constituents may interact antagonistically, such that the risk associated with exposure to these chemicals is less than the sum of the carcinogenic risk or hazard quotients. In these cases, the risk assessment will overestimate the risk associated with exposure to these chemicals.

2.6 Conclusions

This HHRA was conducted to evaluate the potential for human health effects as a result of potential exposures to chemicals in soil, groundwater, and surface water at the OD Grounds at the Seneca Army Depot Activity.

Cumulative carcinogenic risks and noncarcinogenic hazards estimated for the four receptor groups at the site are shown in Table 2.80. The cumulative risk/hazard estimates described below include chromium(III). The cumulative risk/hazard estimates that include chromium(VI) show similar patterns (Table 2.80). Chromium(VI) is not expected to be present at the site based on past munitions-related activities and is not summarized below.

- Hypothetical future resident exposed to surface soil, combined surface and subsurface soil, groundwater as potable water, and surface water:
  - Cumulative carcinogenic risks range from 2 x 10^{-4} (groundwater in MW45-4) to 7 x 10^{-7} (surface soil in Kickout Area). The highest cumulative carcinogenic risk, which is outside USEPA's acceptable carcinogenic risk range of 1 × 10^{-4} to 1 x 10^{-6}, is due to exposure to groundwater as potable water in the center of the OD Hill Area.
  - Cumulative noncarcinogenic hazards for a child range from 0.6 (surface water) to 51 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.
  - Cumulative noncarcinogenic hazards for an adult range from 0.2 (surface water) to 30 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.
- Hypothetical construction workers exposed to surface soil, combined surface and subsurface soil, groundwater as potable water, and surface water:
  - Cumulative carcinogenic risks range from 2 x 10^{-8} (surface soil in Kickout Area) to 2 x 10^{-9} (surface water onsite). All carcinogenic risks are less than USEPA's acceptable carcinogenic risk range of 1 × 10^{-4} to 1 x 10^{-6}.
  - Cumulative noncarcinogenic hazards for an adult range from 0.03 (surface soil in Kickout Area) to 0.1 (surface soil in OD Hill Area). All noncarcinogenic hazard HIs are less than 1.
- Future park workers exposed to surface soil, groundwater as potable water, and surface water:
  - Cumulative carcinogenic risks range from 1 x 10^{-4} (groundwater in MW45-4) to 1 x 10^{-7} (surface water onsite). All carcinogenic risks are within or less than USEPA's acceptable carcinogenic risk range of 1 × 10^{-4} to 1 x 10^{-6}.
  - The cumulative noncarcinogenic hazards for an adult range from 0.03 (surface water onsite) to 19 (groundwater in MW454). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.
- Current and future recreational users exposed to surface soil, groundwater as potable water, and surface water:
  - Cumulative carcinogenic risks range from 1 x 10^{-5} (groundwater in MW45-4) to 6 x 10^{-8} (surface water onsite). All carcinogenic risks are within or less than USEPA's acceptable carcinogenic risk range of 1 × 10^{-4} to 1 x 10^{-6}.
  - Cumulative noncarcinogenic hazards for a child range from 0.09 (surface water onsite) to 3 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.
  - Cumulative noncarcinogenic hazards for an adult range from 0.03 (surface water) to 2 (groundwater in MW45-4). The highest cumulative HI greater than 1 is due to exposure to groundwater as potable water in the center of the OD Hill Area.

Uncertainties may result in overestimated current risks/hazards. Most notably, onsite groundwater is not currently used as a potable drinking water source so the risk/hazard estimates herein may be overestimated. The estimated risks/hazards associated with potable groundwater would apply only if a well were installed for potable water. Further, there are no buildings currently onsite and there are no plans for development of the site in the future. Therefore, near- and long-term residential scenarios are hypothetical and conservative since there are no residential properties onsite currently and it is unlikely the site will be developed as residential property. Therefore, based on the exposure scenarios evaluated in this risk assessment, there are no unacceptable risks/hazards expected for any receptor as a result of exposure to soil, groundwater, or surface water based on current, or reasonably anticipated future land use.

SECTION 3
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TABLES

Section 1 Tables

Table 1.1
Summary of Detections and Preliminary Screening Values
Surface Soil (0 -≤ 2 ft bgs), Open Detonation (OD) Hill
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) (1) (mg/kg)	Number of Detected Samples Greater than RSL
Volatile Organic Compounds							
1,1,1-Trichloroethane	71-55-6	--	0	9	0%	810	0
1,1,2,2-Tetrachloroethane	79-34-5	--	0	9	0%	0.6	0
1,1,2-Trichloroethane	79-00-5	--	0	9	0%	0.15	0
1,1-Dichloroethane	75-34-3	--	0	9	0%	3.6	0
1,1-Dichloroethene	75-35-4	--	0	9	0%	23	0
1,2-Dichloroethane	107-06-2	--	0	9	0%	0.46	0
1,2-Dichloroethene (total)	540-59-0	--	0	9	0%	N/A	0
1,2-Dichloropropane	78-87-5	--	0	9	0%	1	0
Acetone	67-64-1	--	0	9	0%	6100	0
Benzene	71-43-2	--	0	9	0%	1.2	0
Bromodichloromethane	75-27-4	--	0	9	0%	0.29	0
Bromoform	75-25-2	--	0	9	0%	67	0
Carbon disulfide	75-15-0	--	0	9	0%	77	0
Carbon tetrachloride	56-23-5	--	0	9	0%	0.65	0
Chlorobenzene	108-90-7	--	0	9	0%	28	0
Chlorodibromomethane	124-48-1	--	0	9	0%	0.73	0
Chloroethane	75-00-3	--	0	9	0%	1400	0
Chloroform	67-66-3	--	0	9	0%	0.32	0
Cis-1,3-Dichloropropene	10061-01-5	--	0	9	0%	N/A	0
Ethyl benzene	100-41-4	--	0	9	0%	5.8	0
Methyl bromide	74-83-9	--	0	9	0%	0.68	0
Methyl butyl ketone	591-78-6	--	0	9	0%	20	0
Methyl chloride	74-87-3	--	0	9	0%	11	0
Methyl ethyl ketone	78-93-3	--	0	9	0%	2700	0
Methyl isobutyl ketone	108-10-1	--	0	9	0%	530	0
Methylene chloride	75-09-2	--	0	9	0%	35	0
Styrene	100-42-5	--	0	9	0%	600	0
Tetrachloroethene	127-18-4	--	0	9	0%	8.1	0
Toluene	108-88-3	--	0	9	0%	490	0
Total Xylenes	1330-20-7	--	0	9	0%	58	0
Trans-1,3-Dichloropropene	10061-02-6	--	0	9	0%	N/A	0
Trichloroethene	79-01-6	--	0	9	0%	0.41	0
Vinyl chloride	75-01-4	--	0	9	0%	0.059	0
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	120-82-1	--	0	25	0%	5.8	0
1,2-Dichlorobenzene	95-50-1	--	0	25	0%	180	0
1,3-Dichlorobenzene	541-73-1	--	0	25	0%	N/A	0
1,4-Dichlorobenzene	106-46-7	--	0	25	0%	2.6	0
2,2'-oxybis(1-Chloropropane)	108-60-1	--	0	9	0%	4.9	0
2,4,5-Trichlorophenol	95-95-4	--	0	25	0%	620	0
2,4,6-Trichlorophenol	88-06-2	--	0	25	0%	6.2	0
2,4-Dichlorophenol	120-83-2	--	0	25	0%	18	0
2,4-Dimethylphenol	105-67-9	--	0	25	0%	120	0
2,4-Dinitrophenol	51-28-5	--	0	25	0%	12	0
2,4-Dinitrotoluene	121-14-2	2.5	7	25	28%	1.7	1
2,6-Dinitrotoluene	606-20-2	0.041	1	25	4%	0.36	0
2-Chloronaphthalene	91-58-7	--	0	25	0%	630	0
2-Chlorophenol	95-57-8	--	0	25	0%	39	0
2-Methylnaphthalene	91-57-6	--	0	25	0%	23	0
2-Methylphenol	95-48-7	--	0	25	0%	310	0
2-Nitroaniline	88-74-4	--	0	25	0%	61	0
2-Nitrophenol	88-75-5	--	0	25	0%	N/A	0
3 or 4-Methylphenol	N/A	--	0	16	0%	N/A	0
3,3'-Dichlorobenzidine	91-94-1	--	0	25	0%	1.2	0
3-Nitroaniline	99-09-2	--	0	25	0%	N/A	0
4,6-Dinitro-2-methylphenol	534-52-1	--	0	25	0%	0.49	0
4-Bromophenyl phenyl ether	101-55-3	--	0	25	0%	N/A	0
4-Chloro-3-methylphenol	59-50-7	--	0	25	0%	620	0
4-Chloroaniline	106-47-8	--	0	25	0%	2.7	0
4-Chlorophenyl phenyl ether	7005-72-3	--	0	25	0%	N/A	0
4-Methylphenol	106-44-5	--	0	9	0%	620	0
4-Nitroaniline	100-01-6	--	0	25	0%	25	0
4-Nitrophenol	100-02-7	--	0	25	0%	N/A	0
Acenaphthene	83-32-9	--	0	25	0%	350	0
Acenaphthylene	208-96-8	0.03	1	25	4%	N/A	0
Anthracene	120-12-7	0.018	1	25	4%	1700	0
Benzo(a)anthracene	56-55-3	0.05	5	25	20%	0.15	0
Benzo(a)pyrene	50-32-8	0.082	5	25	20%	0.015	5
Benzo(b)fluoranthene	205-99-2	0.055	5	25	20%	0.15	0
Benzo(ghi)perylene	191-24-2	0.048	3	25	12%	N/A	0
Benzo(k)fluoranthene	207-08-9	0.058	4	25	16%	1.5	0

Table 1.1
Summary of Detections and Preliminary Screening Values
Surface Soil (0 -≤ 2 ft bgs), Open Detonation (OD) Hill
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) [(1)] (mg/kg)	Number of Detected Samples Greater than RSL
Bis(2-Chloroethoxy)methane	111-91-1	--	0	25	0%	18	0
Bis(2-Chloroethyl)ether	111-44-4	--	0	25	0%	0.23	0
Bis(2-Chloroisopropyl)ether	108-60-1	--	0	16	0%	4.9	0
Bis(2-Ethylhexyl)phthalate	117-81-7	0.74	4	25	16%	38	0
Butylbenzylphthalate	85-68-7	--	0	25	0%	280	0
Carbazole	86-74-8	--	0	25	0%	N/A	0
Chrysene	218-01-9	0.13	8	25	32%	15	0
Dibenz(a,h)anthracene	53-70-3	--	0	25	0%	0.015	0
Dibenzofuran	132-64-9	--	0	25	0%	7.2	0
Diethyl phthalate	84-66-2	--	0	25	0%	4900	0
Dimethylphthalate	N/A	--	0	25	0%	N/A	0
Di-n-butylphthalate	84-74-2	2.6	7	25	28%	620	0
Di-n-octylphthalate	117-84-0	--	0	25	0%	62	0
Fluoranthene	206-44-0	0.066	7	25	28%	230	0
Fluorene	86-73-7	--	0	25	0%	230	0
Hexachlorobenzene	118-74-1	0.11	7	25	28%	0.33	0
Hexachlorobutadiene	87-68-3	--	0	25	0%	6.2	0
Hexachlorocyclopentadiene	77-47-4	--	0	25	0%	37	0
Hexachloroethane	67-72-1	0.021	1	25	4%	4.3	0
Indeno(1,2,3-cd)pyrene	193-39-5	0.052	2	25	8%	0.15	0
Isophorone	78-59-1	--	0	25	0%	560	0
Naphthalene	91-20-3	0.024	2	25	8%	3.8	0
Nitrobenzene	98-95-3	--	0	25	0%	5.1	0
N-Nitrosodiphenylamine	86-30-6	0.32	2	25	8%	110	0
N-Nitrosodipropylamine	621-64-7	0.11	1	25	4%	0.076	1
Pentachlorophenol	87-86-5	--	0	25	0%	0.99	0
Phenanthrene	85-01-8	0.038	6	25	24%	N/A	0
Phenol	108-95-2	--	0	25	0%	1800	0
Pyrene	129-00-0	0.11	7	25	28%	170	0
Herbicides							
2,4,5-T	93-76-5	--	0	25	0%	62	0
2,4,5-TP/Silvex	93-72-1	--	0	25	0%	49	0
2,4-D	94-75-7	--	0	25	0%	69	0
2,4-DB	94-82-6	--	0	25	0%	49	0
Dalapon	75-99-0	--	0	25	0%	180	0
Dicamba	1918-00-9	--	0	25	0%	180	0
Dichloroprop	N/A	--	0	25	0%	N/A	0
Dinoseb	88-85-7	--	0	25	0%	6.2	0
MCPA	94-74-6	--	0	25	0%	3.1	0
MCPP	93-65-2	--	0	25	0%	6.2	0
Explosives							
1,3,5-Trinitrobenzene	99-35-4	0.12	22	37	59%	220	0
1,3-Dinitrobenzene	99-65-0	--	0	37	0%	0.62	0
2,4,6-Trinitrotoluene	118-96-7	0.19	30	37	81%	3.6	0
2,4-Dinitrotoluene	121-14-2	1.1	31	37	84%	1.7	0
2,6-Dinitrotoluene	606-20-2	--	0	37	0%	0.36	0
2-amino-4,6-Dinitrotoluene	35572-78-2	0.59	30	37	81%	15	0
2-Nitrotoluene	88-72-2	--	0	28	0%	3.2	0
3,5-Dinitroaniline	618-87-1	--	0	28	0%	N/A	0
3-Nitrotoluene	99-08-1	--	0	28	0%	0.62	0
4-amino-2,6-Dinitrotoluene	19406-51-0	0.5	26	37	70%	15	0
4-Nitrotoluene	99-99-0	--	0	28	0%	25	0
HMX	2691-41-0	0.19	26	37	70%	380	0
Nitrobenzene	98-95-3	--	0	28	0%	5.1	0
Nitroglycerine	55-63-0	1.5	1	28	4%	0.62	1
Pentaerythritol Tetranitrate	78-11-5	--	0	28	0%	12	0
RDX	121-82-4	1.8	32	37	86%	6	0
Tetryl	479-45-8	0.33	4	37	11%	12	0
Pesticides/PCBs							
Aroclor-1016	12674-11-2	--	0	25	0%	0.4	0
Aroclor-1221	11104-28-2	--	0	25	0%	0.15	0
Aroclor-1232	11141-16-5	--	0	25	0%	0.15	0
Aroclor-1242	53469-21-9	--	0	25	0%	0.24	0
Aroclor-1248	12672-29-6	--	0	25	0%	0.24	0
Aroclor-1254	11097-69-1	2	4	25	16%	0.11	2
Aroclor-1260	11096-82-5	--	0	25	0%	0.24	0
4,4'-DDD	72-54-8	0.0024	2	25	8%	2.2	0
4,4'-DDE	72-55-9	0.012	20	25	80%	1.6	0
4,4'-DDT	50-29-3	0.0034	15	25	60%	1.9	0
Aldrin	309-00-2	0.0022	1	25	4%	0.031	0
Alpha-BHC	319-84-6	--	0	25	0%	0.085	0
Alpha-Chlordane	5103-71-9	0.0057	5	25	20%	N/A	0

Table 1.1
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Surface Soil (0 -≤ 2 ft bgs), Open Detonation (OD) Hill
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) (1) (mg/kg)	Number of Detected Samples Greater than RSL
Beta-BHC	319-85-7	--	0	25	0%	0.30	0
Delta-BHC	N/A	--	0	25	0%	N/A	0
Dieldrin	60-57-1	0.0074	13	25	52%	0.033	0
Endosulfan I	115-29-7	0.032	17	25	68%	37	0
Endosulfan II	33213-65-9	0.00088	1	25	4%	N/A	0
Endosulfan sulfate	1031-07-8	--	0	25	0%	N/A	0
Endrin	72-20-8	0.0036	1	25	4%	1.8	0
Endrin aldehyde	7421-93-4	0.0032	1	25	4%	N/A	0
Endrin ketone	53494-70-5	0.00058	1	25	4%	N/A	0
Gamma-BHC/Lindane	58-89-9	--	0	25	0%	0.56	0
Gamma-Chlordane	5103-74-2	0.0011	3	25	12%	N/A	0
Heptachlor	76-44-8	--	0	25	0%	0.12	0
Heptachlor epoxide	1024-57-3	--	0	25	0%	0.059	0
Methoxychlor	72-43-5	0.045	1	25	4%	31	0
Toxaphene	8001-35-2	--	0	25	0%	0.48	0
Inorganics							
Aluminum	7429-90-5	35000	55	55	100%	7700	54
Antimony	7440-36-0	3.10	20	55	36%	3.10	0
Arsenic	7440-38-2	16.1	55	55	100%	0.67	55
Barium	7440-39-3	308	55	55	100%	1500	0
Beryllium	7440-41-7	1.40	53	55	96%	16	0
Cadmium	7440-43-9	1100	52	55	95%	7.00	31
Calcium	14452-75-6	193000	54	55	98%	N/A	0
Chromium	18540-29-9	446	55	55	100%	0.30	55
Cobalt	7440-48-4	19.7	55	55	100%	2.30	55
Copper	7440-50-8	4180	55	55	100%	310	38
Cyanide	57-12-5	--	0	9	0%	2.10	0
Iron	7439-89-6	118000	55	55	100%	5500	55
Lead	7439-92-1	998	55	55	100%	400	1
Magnesium	7439-95-4	15000	55	55	100%	N/A	0
Manganese	7439-96-5	1080	55	55	100%	180	55
Mercury	7487-94-7	7.00	55	55	100%	2.30	38
Nickel	7440-02-0	67.7	53	53	100%	150	0
Potassium	7440-09-7	4880	34	34	100%	N/A	0
Selenium	7782-49-2	0.73	2	55	4%	39.00	0
Silver	7440-22-4	205	45	55	82%	39.00	1
Sodium	7440-23-5	377	52	55	95%	N/A	0
Thallium	7440-28-0	0.27	4	55	7%	0.08	4
Vanadium	7440-62-2	53.7	55	55	100%	39.00	2
Zinc	7440-66-6	1350	53	53	100%	2300	0

(1) USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.
-- = Not detected in any sample.
N/A = RSL not available.

Table 1.2
Summary of Detections and Preliminary Screening Values
Combined Surface and Subsurface Soil (0 -≤ 15 ft bgs), Open Detonation (OD) Hill
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) [(1)] (mg/kg)	Number of Detected Samples Greater than RSL
Volatile Organic Compounds							
1,1,1-Trichloroethane	71-55-6	--	0	15	0%	810	0
1,1,2,2-Tetrachloroethane	79-34-5	--	0	15	0%	0.6	0
1,1,2-Trichloroethane	79-00-5	--	0	15	0%	0.15	0
1,1-Dichloroethane	75-34-3	--	0	15	0%	3.6	0
1,1-Dichloroethene	75-35-4	--	0	15	0%	23	0
1,2-Dichloroethane	107-06-2	--	0	15	0%	0.46	0
1,2-Dichloroethene (total)	540-59-0	--	0	15	0%	N/A	0
1,2-Dichloropropane	78-87-5	--	0	15	0%	1	0
Acetone	67-64-1	--	0	15	0%	6100	0
Benzene	71-43-2	--	0	15	0%	1.2	0
Bromodichloromethane	75-27-4	--	0	15	0%	0.29	0
Bromoform	75-25-2	--	0	15	0%	67	0
Carbon disulfide	75-15-0	--	0	15	0%	77	0
Carbon tetrachloride	56-23-5	--	0	15	0%	0.65	0
Chlorobenzene	108-90-7	--	0	15	0%	28	0
Chlorodibromomethane	124-48-1	--	0	15	0%	0.73	0
Chloroethane	75-00-3	--	0	15	0%	1400	0
Chloroform	67-66-3	--	0	15	0%	0.32	0
Cis-1,3-Dichloropropene	10061-01-5	--	0	15	0%	N/A	0
Ethyl benzene	100-41-4	--	0	15	0%	5.8	0
Methyl bromide	74-83-9	--	0	15	0%	0.68	0
Methyl butyl ketone	591-78-6	--	0	15	0%	20	0
Methyl chloride	74-87-3	--	0	15	0%	11	0
Methyl ethyl ketone	78-93-3	--	0	15	0%	2700	0
Methyl isobutyl ketone	108-10-1	--	0	15	0%	530	0
Methylene chloride	75-09-2	--	0	15	0%	35	0
Styrene	100-42-5	--	0	15	0%	600	0
Tetrachloroethene	127-18-4	0.019	6	15	40%	8.1	0
Toluene	108-88-3	--	0	15	0%	490	0
Total Xylenes	1330-20-7	--	0	15	0%	58	0
Trans-1,3-Dichloropropene	10061-02-6	--	0	15	0%	N/A	0
Trichloroethene	79-01-6	--	0	15	0%	0.41	0
Vinyl chloride	75-01-4	--	0	15	0%	0.059	0
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	120-82-1	--	0	31	0%	5.8	0
1,2-Dichlorobenzene	95-50-1	--	0	31	0%	180	0
1,3-Dichlorobenzene	541-73-1	--	0	31	0%	N/A	0
1,4-Dichlorobenzene	106-46-7	--	0	31	0%	2.6	0
2,2'-oxybis(1-Chloropropane)	108-60-1	--	0	15	0%	4.9	0
2,4,5-Trichlorophenol	95-95-4	--	0	31	0%	620	0
2,4,6-Trichlorophenol	88-06-2	--	0	31	0%	6.2	0
2,4-Dichlorophenol	120-83-2	--	0	31	0%	18	0
2,4-Dimethylphenol	105-67-9	--	0	31	0%	120	0
2,4-Dinitrophenol	51-28-5	--	0	31	0%	12	0
2,4-Dinitrotoluene	121-14-2	14	13	31	42%	1.7	2
2,6-Dinitrotoluene	606-20-2	0.7	2	31	6%	0.36	1
2-Chloronaphthalene	91-58-7	--	0	31	0%	630	0
2-Chlorophenol	95-57-8	--	0	31	0%	39	0
2-Methylnaphthalene	91-57-6	--	0	31	0%	23	0
2-Methylphenol	95-48-7	--	0	31	0%	310	0
2-Nitroaniline	88-74-4	--	0	31	0%	61	0
2-Nitrophenol	88-75-5	--	0	31	0%	N/A	0
3 or 4-Methylphenol	N/A	--	0	16	0%	N/A	0
3,3'-Dichlorobenzidine	91-94-1	--	0	31	0%	1.2	0
3-Nitroaniline	99-09-2	--	0	31	0%	N/A	0
4,6-Dinitro-2-methylphenol	534-52-1	--	0	31	0%	0.49	0
4-Bromophenyl phenyl ether	101-55-3	--	0	31	0%	N/A	0
4-Chloro-3-methylphenol	59-50-7	--	0	31	0%	620	0
4-Chloroaniline	106-47-8	--	0	31	0%	2.7	0
4-Chlorophenyl phenyl ether	7005-72-3	--	0	31	0%	N/A	0
4-Methylphenol	106-44-5	--	0	15	0%	620	0
4-Nitroaniline	100-01-6	--	0	31	0%	25	0
4-Nitrophenol	100-02-7	--	0	31	0%	N/A	0
Acenaphthene	83-32-9	--	0	31	0%	350	0
Acenaphthylene	208-96-8	0.03	3	31	10%	N/A	0
Anthracene	120-12-7	0.018	2	31	6%	1700	0
Benzo(a)anthracene	56-55-3	0.05	10	31	32%	0.15	0
Benzo(a)pyrene	50-32-8	0.082	10	31	32%	0.015	10
Benzo(b)fluoranthene	205-99-2	0.055	10	31	32%	0.15	0
Benzo(ghi)perylene	191-24-2	0.066	8	31	26%	N/A	0

Table 1.2
Summary of Detections and Preliminary Screening Values
Combined Surface and Subsurface Soil (0 -≤ 15 ft bgs), Open Detonation (OD) Hill
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) [(1)] (mg/kg)	Number of Detected Samples Greater than RSL
Benzo(k)fluoranthene	207-08-9	0.058	9	31	29%	1.5	0
Bis(2-Chloroethoxy)methane	111-91-1	--	0	31	0%	18	0
Bis(2-Chloroethyl)ether	111-44-4	--	0	31	0%	0.23	0
Bis(2-Chloroisopropyl)ether	108-60-1	--	0	16	0%	4.9	0
Bis(2-Ethylhexyl)phthalate	117-81-7	0.74	6	31	19%	38	0
Butylbenzylphthalate	85-68-7	--	0	31	0%	280	0
Carbazole	86-74-8	--	0	31	0%	N/A	0
Chrysene	218-01-9	0.13	13	31	42%	15	0
Dibenz(a,h)anthracene	53-70-3	--	0	31	0%	0.015	0
Dibenzofuran	132-64-9	--	0	31	0%	7.2	0
Diethyl phthalate	84-66-2	0.035	1	31	3%	4900	0
Dimethylphthalate	N/A	--	0	31	0%	N/A	0
Di-n-butylphthalate	84-74-2	6.8	13	31	42%	620	0
Di-n-octylphthalate	117-84-0	--	0	31	0%	62	0
Fluoranthene	206-44-0	0.068	12	31	39%	230	0
Fluorene	86-73-7	--	0	31	0%	230	0
Hexachlorobenzene	118-74-1	0.11	12	31	39%	0.33	0
Hexachlorobutadiene	87-68-3	--	0	31	0%	6.2	0
Hexachlorocyclopentadiene	77-47-4	--	0	31	0%	37	0
Hexachloroethane	67-72-1	1.1	6	31	19%	4.3	0
Indeno(1,2,3-cd)pyrene	193-39-5	0.052	5	31	16%	0.15	0
Isophorone	78-59-1	--	0	31	0%	560	0
Naphthalene	91-20-3	0.03	6	31	19%	3.8	0
Nitrobenzene	98-95-3	--	0	31	0%	5.1	0
N-Nitrosodiphenylamine	86-30-6	0.32	2	31	6%	110	0
N-Nitrosodipropylamine	621-64-7	1.6	5	31	16%	0.076	2
Pentachlorophenol	87-86-5	--	0	31	0%	0.99	0
Phenanthrene	85-01-8	0.046	11	31	35%	N/A	0
Phenol	108-95-2	--	0	31	0%	1800	0
Pyrene	129-00-0	0.11	13	31	42%	170	0
Herbicides							
2,4,5-T	93-76-5	--	0	31	0%	62	0
2,4,5-TP/Silvex	93-72-1	--	0	31	0%	49	0
2,4-D	94-75-7	--	0	31	0%	69	0
2,4-DB	94-82-6	--	0	31	0%	49	0
Dalapon	75-99-0	--	0	31	0%	180	0
Dicamba	1918-00-9	--	0	31	0%	180	0
Dichloroprop	N/A	--	0	31	0%	N/A	0
Dinoseb	88-85-7	--	0	31	0%	6.2	0
MCPA	94-74-6	--	0	31	0%	3.1	0
MCPP	93-65-2	--	0	31	0%	6.2	0
Explosives							
1,3,5-Trinitrobenzene	99-35-4	0.19	27	43	63%	220	0
1,3-Dinitrobenzene	99-65-0	--	0	43	0%	0.62	0
2,4,6-Trinitrotoluene	118-96-7	0.6	36	43	84%	3.6	0
2,4-Dinitrotoluene	121-14-2	1.1	36	43	84%	1.7	0
2,6-Dinitrotoluene	606-20-2	--	0	43	0%	0.36	0
2-amino-4,6-Dinitrotoluene	35572-78-2	0.68	36	43	84%	15	0
2-Nitrotoluene	88-72-2	--	0	28	0%	3.2	0
3,5-Dinitroaniline	618-87-1	--	0	28	0%	N/A	0
3-Nitrotoluene	99-08-1	--	0	28	0%	0.62	0
4-amino-2,6-Dinitrotoluene	19406-51-0	0.5	26	43	60%	15	0
4-Nitrotoluene	99-99-0	--	0	28	0%	25	0
HMX	2691-41-0	0.47	32	43	74%	380	0
Nitrobenzene	98-95-3	--	0	28	0%	5.1	0
Nitroglycerine	55-63-0	1.5	1	28	4%	0.62	1
Pentaerythritol Tetranitrate	78-11-5	--	0	28	0%	12	0
RDX	121-82-4	4.3	38	43	88%	6	0
Tetryl	479-45-8	0.33	5	43	12%	12	0
Pesticides/PCBs							
Aroclor-1016	12674-11-2	--	0	31	0%	0.4	0
Aroclor-1221	11104-28-2	--	0	31	0%	0.15	0
Aroclor-1232	11141-16-5	--	0	31	0%	0.15	0
Aroclor-1242	53469-21-9	--	0	31	0%	0.24	0
Aroclor-1248	12672-29-6	--	0	31	0%	0.24	0
Aroclor-1254	11097-69-1	2	4	31	13%	0.11	2
Aroclor-1260	11096-82-5	--	0	31	0%	0.24	0
4,4'-DDD	72-54-8	0.0024	2	31	6%	2.2	0
4,4'-DDE	72-55-9	0.012	22	31	71%	1.6	0
4,4'-DDT	50-29-3	0.0034	17	31	55%	1.9	0
Aldrin	309-00-2	0.0022	1	31	3%	0.031	0

Table 1.2
Summary of Detections and Preliminary Screening Values
Combined Surface and Subsurface Soil (0 -≤ 15 ft bgs), Open Detonation (OD) Hill
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) (1) (mg/kg)	Number of Detected Samples Greater than RSL
Alpha-BHC	319-84-6	--	0	31	0%	0.085	0
Alpha-Chlordane	5103-71-9	0.0057	5	31	16%	N/A	0
Beta-BHC	319-85-7	--	0	31	0%	0.30	0
Delta-BHC	N/A	--	0	31	0%	N/A	0
Dieldrin	60-57-1	0.0074	14	31	45%	0.033	0
Endosulfan I	115-29-7	0.032	21	31	68%	37	0
Endosulfan II	33213-65-9	0.00088	1	31	3%	N/A	0
Endosulfan sulfate	1031-07-8	--	0	31	0%	N/A	0
Endrin	72-20-8	0.0036	1	31	3%	1.8	0
Endrin aldehyde	7421-93-4	0.0032	1	31	3%	N/A	0
Endrin ketone	53494-70-5	0.00058	1	31	3%	N/A	0
Gamma-BHC/Lindane	58-89-9	--	0	31	0%	0.56	0
Gamma-Chlordane	5103-74-2	0.0011	3	31	10%	N/A	0
Heptachlor	76-44-8	--	0	31	0%	0.12	0
Heptachlor epoxide	1024-57-3	--	0	31	0%	0.059	0
Methoxychlor	72-43-5	0.045	1	31	3%	31	0
Toxaphene	8001-35-2	--	0	31	0%	0.48	0
Inorganics							
Aluminum	7429-90-5	35000	76	76	100%	7700.00	75
Antimony	7440-36-0	5.10	28	76	37%	3.10	1
Arsenic	7440-38-2	16.1	76	76	100%	0.67	76
Barium	7440-39-3	308	76	76	100%	1500.00	0
Beryllium	7440-41-7	1.40	74	76	97%	16.00	0
Cadmium	7440-43-9	1100	70	74	95%	7.00	40
Calcium	14452-75-6	193000	75	76	99%	N/A	0
Chromium	18540-29-9	446	76	76	100%	0.30	76
Cobalt	7440-48-4	19.7	76	76	100%	2.30	76
Copper	7440-50-8	7310	76	76	100%	310.00	51
Cyanide	57-12-5	0.70	2	15	13%	2.10	0
Iron	7439-89-6	118000	76	76	100%	5500.00	76
Lead	7439-92-1	998	76	76	100%	400.00	1
Magnesium	7439-95-4	15000	76	76	100%	N/A	0
Manganese	7439-96-5	1380	76	76	100%	180.00	76
Mercury	7487-94-7	9.10	76	76	100%	2.30	55
Nickel	7440-02-0	67.7	74	74	100%	150.00	0
Potassium	7440-09-7	4880	55	55	100%	N/A	0
Selenium	7782-49-2	0.73	3	76	4%	39.00	0
Silver	7440-22-4	205	64	76	84%	39.00	2
Sodium	7440-23-5	377	73	76	96%	N/A	0
Thallium	7440-28-0	0.27	6	76	8%	0.08	6
Vanadium	7440-62-2	53.7	76	76	100%	39.00	2
Zinc	7440-66-6	1470	74	74	100%	2300.00	0

(1) USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at:
http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.
-- = Not detected in any sample.
N/A = RSL not available.

Table 1.3
Summary of Detections and Preliminary Screening Values
Surface Soil (0 -≤ 2 ft bgs), Kickout Area
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) (1) (mg/kg)	Number of Detected Samples Greater than RSL
Volatile Organic Compounds							
1,1,1-Trichloroethane	71-55-6	--	0	5	0%	810	0
1,1,2,2-Tetrachloroethane	79-34-5	--	0	5	0%	0.6	0
1,1,2-Trichloroethane	79-00-5	--	0	5	0%	0.15	0
1,1-Dichloroethane	75-34-3	--	0	5	0%	3.6	0
1,1-Dichloroethene	75-35-4	--	0	5	0%	23	0
1,2-Dichloroethane	107-06-2	--	0	5	0%	0.46	0
1,2-Dichloroethene (total)	540-59-0	--	0	5	0%	N/A	0
1,2-Dichloropropane	78-87-5	--	0	5	0%	1	0
Acetone	67-64-1	--	0	5	0%	6100	0
Benzene	71-43-2	--	0	5	0%	1.2	0
Bromodichloromethane	75-27-4	--	0	5	0%	0.29	0
Bromoform	75-25-2	--	0	5	0%	67	0
Carbon disulfide	75-15-0	--	0	5	0%	77	0
Carbon tetrachloride	56-23-5	--	0	5	0%	0.65	0
Chlorobenzene	108-90-7	--	0	5	0%	28	0
Chlorodibromomethane	124-48-1	--	0	5	0%	0.73	0
Chloroethane	75-00-3	--	0	5	0%	1400	0
Chloroform	67-66-3	--	0	5	0%	0.32	0
Cis-1,3-Dichloropropene	10061-01-5	--	0	5	0%	N/A	0
Ethyl benzene	100-41-4	--	0	5	0%	5.8	0
Methyl bromide	74-83-9	--	0	5	0%	0.68	0
Methyl butyl ketone	591-78-6	--	0	5	0%	20	0
Methyl chloride	74-87-3	--	0	5	0%	11	0
Methyl ethyl ketone	78-93-3	--	0	5	0%	2700	0
Methyl isobutyl ketone	108-10-1	--	0	5	0%	530	0
Methylene chloride	75-09-2	--	0	5	0%	35	0
Styrene	100-42-5	--	0	5	0%	600	0
Tetrachloroethene	127-18-4	--	0	5	0%	8.1	0
Toluene	108-88-3	--	0	5	0%	490	0
Total Xylenes	1330-20-7	--	0	5	0%	58	0
Trans-1,3-Dichloropropene	10061-02-6	--	0	5	0%	N/A	0
Trichloroethene	79-01-6	--	0	5	0%	0.41	0
Vinyl chloride	75-01-4	--	0	5	0%	0.059	0
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	120-82-1	--	0	8	0%	5.8	0
1,2-Dichlorobenzene	95-50-1	--	0	8	0%	180	0
1,3-Dichlorobenzene	541-73-1	--	0	8	0%	N/A	0
1,4-Dichlorobenzene	106-46-7	--	0	8	0%	2.6	0
2,2'-oxybis(1-Chloropropane)	108-60-1	--	0	5	0%	4.9	0
2,4,5-Trichlorophenol	95-95-4	--	0	8	0%	620	0
2,4,6-Trichlorophenol	88-06-2	--	0	8	0%	6.2	0
2,4-Dichlorophenol	120-83-2	--	0	8	0%	18	0
2,4-Dimethylphenol	105-67-9	--	0	8	0%	120	0
2,4-Dinitrophenol	51-28-5	--	0	8	0%	12	0
2,4-Dinitrotoluene	121-14-2	--	0	8	0%	1.7	0
2,6-Dinitrotoluene	606-20-2	--	0	8	0%	0.36	0
2-Chloronaphthalene	91-58-7	--	0	8	0%	630	0
2-Chlorophenol	95-57-8	--	0	8	0%	39	0
2-Methylnaphthalene	91-57-6	--	0	8	0%	23	0
2-Methylphenol	95-48-7	--	0	8	0%	310	0
2-Nitroaniline	88-74-4	--	0	8	0%	61	0
2-Nitrophenol	88-75-5	--	0	8	0%	N/A	0
3 or 4-Methylphenol	na	--	0	3	0%	N/A	0
3,3'-Dichlorobenzidine	91-94-1	--	0	8	0%	1.2	0
3-Nitroaniline	99-09-2	--	0	8	0%	N/A	0
4,6-Dinitro-2-methylphenol	534-52-1	--	0	8	0%	0.49	0
4-Bromophenyl phenyl ether	101-55-3	--	0	8	0%	N/A	0
4-Chloro-3-methylphenol	59-50-7	--	0	8	0%	620	0
4-Chloroaniline	106-47-8	--	0	8	0%	2.7	0
4-Chlorophenyl phenyl ether	7005-72-3	--	0	8	0%	N/A	0
4-Methylphenol	106-44-5	--	0	5	0%	620	0
4-Nitroaniline	100-01-6	--	0	8	0%	25	0
4-Nitrophenol	100-02-7	--	0	8	0%	N/A	0
Acenaphthene	83-32-9	--	0	8	0%	350	0
Acenaphthylene	208-96-8	--	0	8	0%	N/A	0
Anthracene	120-12-7	--	0	8	0%	1700	0
Benzo(a)anthracene	56-55-3	--	0	8	0%	0.15	0
Benzo(a)pyrene	50-32-8	--	0	8	0%	0.015	0
Benzo(b)fluoranthene	205-99-2	0.02	1	8	13%	0.15	0
Benzo(ghi)perylene	191-24-2	--	0	8	0%	N/A	0
Benzo(k)fluoranthene	207-08-9	--	0	8	0%	1.5	0

Table 1.3
Summary of Detections and Preliminary Screening Values
Surface Soil (0 -≤ 2 ft bgs), Kickout Area
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) (1) (mg/kg)	Number of Detected Samples Greater than RSL
Volatile Organic Compounds							
Bis(2-Chloroethoxy)methane	111-91-1	--	0	8	0%	18	0
Bis(2-Chloroethyl)ether	111-44-4	--	0	8	0%	0.23	0
Bis(2-Chloroisopropyl)ether	108-60-1	--	0	3	0%	4.9	0
Bis(2-Ethylhexyl)phthalate	117-81-7	0.70	3	8	38%	38	0
Butylbenzylphthalate	85-68-7	--	0	8	0%	280	0
Carbazole	86-74-8	--	0	8	0%	N/A	0
Chrysene	218-01-9	0.027	2	8	25%	15	0
Dibenz(a,h)anthracene	53-70-3	--	0	8	0%	0.015	0
Dibenzofuran	132-64-9	--	0	8	0%	7.2	0
Diethyl phthalate	84-66-2	--	0	8	0%	4900	0
Dimethylphthalate	na	--	0	8	0%	N/A	0
Di-n-butylphthalate	84-74-2	--	0	8	0%	620	0
Di-n-octylphthalate	117-84-0	--	0	8	0%	62	0
Fluoranthene	206-44-0	0.03	2	8	25%	230	0
Fluorene	86-73-7	--	0	8	0%	230	0
Hexachlorobenzene	118-74-1	0.03	1	8	13%	0.33	0
Hexachlorobutadiene	87-68-3	--	0	8	0%	6.2	0
Hexachlorocyclopentadiene	77-47-4	--	0	8	0%	37	0
Hexachloroethane	67-72-1	--	0	8	0%	4.3	0
Indeno(1,2,3-cd)pyrene	193-39-5	--	0	8	0%	0.15	0
Isophorone	78-59-1	--	0	8	0%	560	0
Naphthalene	91-20-3	--	0	8	0%	3.8	0
Nitrobenzene	98-95-3	--	0	8	0%	5.1	0
N-Nitrosodiphenylamine	86-30-6	--	0	8	0%	110	0
N-Nitrosodipropylamine	621-64-7	--	0	8	0%	0.076	0
Pentachlorophenol	87-86-5	--	0	8	0%	0.99	0
Phenanthrene	85-01-8	0.018	1	8	13%	N/A	0
Phenol	108-95-2	--	0	8	0%	1800	0
Pyrene	129-00-0	0.036	2	8	25%	170	0
Herbicides							
2,4,5-T	93-76-5	--	0	8	0%	62	0
2,4,5-TP/Silvex	93-72-1	--	0	8	0%	49	0
2,4-D	94-75-7	--	0	8	0%	69	0
2,4-DB	94-82-6	--	0	8	0%	49	0
Dalapon	75-99-0	--	0	8	0%	180	0
Dicamba	1918-00-9	--	0	8	0%	180	0
Dichloroprop	na	--	0	8	0%	N/A	0
Dinoseb	88-85-7	--	0	8	0%	6.2	0
MCPA	94-74-6	9.40	2	8	25%	3.1	2
MCPP	93-65-2	--	0	8	0%	6.2	0
Explosives							
1,3,5-Trinitrobenzene	99-35-4	0.1	1	8	13%	220	0
1,3-Dinitrobenzene	99-65-0	--	0	8	0%	0.62	0
2,4,6-Trinitrotoluene	118-96-7	1.40	3	8	38%	3.6	0
2,4-Dinitrotoluene	121-14-2	0.84	1	8	13%	1.7	0
2,6-Dinitrotoluene	606-20-2	--	0	8	0%	0.36	0
2-amino-4,6-Dinitrotoluene	35572-78-2	0.099	1	8	13%	15	0
2-Nitrotoluene	88-72-2	--	0	3	0%	3.2	0
3,5-Dinitroaniline	618-87-1	--	0	3	0%	N/A	0
3-Nitrotoluene	99-08-1	--	0	3	0%	0.62	0
4-amino-2,6-Dinitrotoluene	19406-51-0	0.27	1	8	13%	15	0
4-Nitrotoluene	99-99-0	--	0	3	0%	25	0
HMX	2691-41-0	--	0	8	0%	380	0
Nitrobenzene	98-95-3	--	0	3	0%	5.1	0
Nitroglycerine	55-63-0	--	0	3	0%	0.62	0
Pentaerythritol Tetranitrate	78-11-5	--	0	3	0%	12	0
RDX	121-82-4	5.80	2	8	25%	6	0
Tetryl	479-45-8	--	0	8	0%	12	0
Pesticides/PCBs							
Aroclor-1016	12674-11-2	--	0	7	0%	0.4	0
Aroclor-1221	11104-28-2	--	0	7	0%	0.15	0
Aroclor-1232	11141-16-5	--	0	7	0%	0.15	0
Aroclor-1242	53469-21-9	--	0	7	0%	0.24	0
Aroclor-1248	12672-29-6	--	0	7	0%	0.24	0
Aroclor-1254	11097-69-1	--	0	7	0%	0.11	0
Aroclor-1260	11096-82-5	--	0	7	0%	0.24	0
4,4'-DDD	72-54-8	--	0	7	0%	2.2	0
4,4'-DDE	72-55-9	0.0033	2	8	25%	1.6	0
4,4'-DDT	50-29-3	--	0	7	0%	1.9	0
Aldrin	309-00-2	--	0	7	0%	0.031	0
Alpha-BHC	319-84-6	--	0	7	0%	0.085	0

Table 1.3
Summary of Detections and Preliminary Screening Values
Surface Soil (0 -≤ 2 ft bgs), Kickout Area
Seneca Army Depot Activity

Parameter	CAS Number	Maximum Detected Concentration Detection (mg/kg)	Number of samples with Detected Concentrations	Total Number of Samples	Frequency of Detection	Regional Screening Levels (RSL) (1) (mg/kg)	Number of Detected Samples Greater than RSL
Volatile Organic Compounds							
Alpha-Chlordane	5103-71-9	--	0	7	0%	N/A	0
Beta-BHC	319-85-7	--	0	7	0%	0.30	0
Delta-BHC	na	--	0	7	0%	N/A	0
Dieldrin	60-57-1	0.00079	1	7	14%	0.033	0
Endosulfan I	115-29-7	0.055	2	8	25%	37	0
Endosulfan II	33213-65-9	--	0	7	0%	N/A	0
Endosulfan sulfate	1031-07-8	--	0	7	0%	N/A	0
Endrin	72-20-8	--	0	7	0%	1.8	0
Endrin aldehyde	7421-93-4	--	0	7	0%	N/A	0
Endrin ketone	53494-70-5	--	0	7	0%	N/A	0
Gamma-BHC/Lindane	58-89-9	--	0	7	0%	0.56	0
Gamma-Chlordane	5103-74-2	--	0	7	0%	N/A	0
Heptachlor	76-44-8	--	0	7	0%	0.12	0
Heptachlor epoxide	1024-57-3	--	0	7	0%	0.059	0
Methoxychlor	72-43-5	--	0	7	0%	31	0
Toxaphene	8001-35-2	--	0	7	0%	0.48	0
Inorganics							
Aluminum	7429-90-5	25000	25	25	100%	7700.00	25
Antimony	7440-36-0	2.40	4	25	16%	3.10	0
Arsenic	7440-38-2	7.60	25	25	100%	0.67	25
Barium	7440-39-3	365	25	25	100%	1500.00	0
Beryllium	7440-41-7	1.00	25	25	100%	16.00	0
Cadmium	7440-43-9	8.30	11	25	44%	7.00	1
Calcium	14452-75-6	41300	25	25	100%	N/A	0
Chromium	18540-29-9	39.3	25	25	100%	0.30	25
Cobalt	7440-48-4	26.8	25	25	100%	2.30	25
Copper	7440-50-8	293	25	25	100%	310.00	0
Cyanide	57-12-5	--	0	5	0%	2.10	0
Iron	7439-89-6	75700	25	25	100%	5500.00	25
Lead	7439-92-1	198	25	25	100%	400.00	0
Magnesium	7439-95-4	8440	25	25	100%	N/A	0
Manganese	7439-96-5	5040	25	25	100%	180.00	25
Nickel	7440-02-0	56.0	22	22	100%	150.00	0
Potassium	7440-09-7	4140	25	25	100%	N/A	0
Selenium	7782-49-2	0.92	1	25	4%	39.00	0
Silver	7440-22-4	2.30	5	25	20%	39.00	0
Sodium	7440-23-5	138	12	25	48%	N/A	0
Thallium	7440-28-0	--	0	25	0%	0.08	0
Vanadium	7440-62-2	41.9	25	25	100%	39.00	1
Zinc	7440-66-6	383	22	22	100%	2300.00	0
Mercury	7487-94-7	1.90	24	25	96%	2.30	0

(1) USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at:
-- = Not detected in any sample.
N/A = RSL not available.
na = CAS number not available.

Table 1.4
Summary of Detections and Preliminary Screening Values
Groundwater, All Wells Combined
Seneca Army Depot Activity

Analyte Name	CAS Number	Total Number of Samples	Number of samples with Detected Concentrations	Frequency of Detection	Minimum Detection Limit (µg/L)	Maximum Detection Limit (µg/L)	Minimum Method Detection Limit (µg/L)	Maximum Method Detection Limit (µg/L)	Regional Screening Level [(1)] (µg/L)	Number of Detected Samples Greater than RSL
Volatile Organic Compounds										
1,1,1-Trichloroethane	71-55-6	8	0	0%	--	--	10	10	--	--
1,1,2,2-Tetrachloroethane	79-34-5	8	0	0%	--	--	10	10	--	--
1,1,2-Trichloroethane	79-00-5	8	0	0%	--	--	10	10	--	--
1,1-Dichloroethane	75-34-3	8	0	0%	--	--	10	10	--	--
1,1-Dichloroethene	75-35-4	8	0	0%	--	--	10	10	--	--
1,2-Dichloroethane	107-06-2	8	0	0%	--	--	10	10	--	--
1,2-Dichloroethene (total)	540-59-0	8	0	0%	--	--	10	10	--	--
1,2-Dichloropropane	78-87-5	8	0	0%	--	--	10	10	--	--
Acetone	67-64-1	8	0	0%	--	--	10	10	--	--
Benzene	71-43-2	8	0	0%	--	--	10	10	--	--
Bromodichloromethane	75-27-4	8	0	0%	--	--	10	10	--	--
Bromoform	75-25-2	8	0	0%	--	--	10	10	--	--
Carbon disulfide	75-15-0	8	0	0%	--	--	10	10	--	--
Carbon tetrachloride	56-23-5	8	0	0%	--	--	10	10	--	--
Chlorobenzene	108-90-7	8	0	0%	--	--	10	10	--	--
Chlorodibromomethane	124-48-1	8	0	0%	--	--	10	10	--	--
Chloroethane	75-00-3	8	0	0%	--	--	10	10	--	--
Chloroform	67-66-3	8	0	0%	--	--	10	10	--	--
Cis-1,3-Dichloropropene	10061-01-5	8	0	0%	--	--	10	10	--	--
Ethyl benzene	100-41-4	8	0	0%	--	--	10	10	--	--
Methyl bromide	74-83-9	8	0	0%	--	--	10	10	--	--
Methyl butyl ketone	591-78-6	8	0	0%	--	--	10	10	--	--
Methyl chloride	74-87-3	8	0	0%	--	--	10	10	--	--
Methyl ethyl ketone	78-93-3	8	0	0%	--	--	10	10	--	--
Methyl isobutyl ketone	108-10-1	8	0	0%	--	--	10	10	--	--
Methylene chloride	75-09-2	8	0	0%	--	--	10	10	--	--
Styrene	100-42-5	8	0	0%	--	--	10	10	--	--
Tetrachloroethene	127-18-4	8	1	13%	1	1	10	10	4.1	0
Toluene	108-88-3	8	0	0%	--	--	10	10	--	--
Total Xylenes	1330-20-7	8	0	0%	--	--	10	10	--	--
Trans-1,3-Dichloropropene	10061-02-6	8	0	0%	--	--	10	10	--	--
Trichloroethene	79-01-6	8	0	0%	--	--	10	10	--	--
Vinyl chloride	75-01-4	8	0	0%	--	--	10	10	--	--
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	120-82-1	8	0	0%	--	--	10	11	--	--
1,2-Dichlorobenzene	95-50-1	8	0	0%	--	--	10	11	--	--
1,3-Dichlorobenzene	541-73-1	8	0	0%	--	--	10	11	--	--
1,4-Dichlorobenzene	106-46-7	8	0	0%	--	--	10	11	--	--
2,2'-oxybis(1-Chloropropane)	108-60-1	8	0	0%	--	--	10	11	--	--
2,4,5-Trichlorophenol	95-95-4	8	0	0%	--	--	25	28	--	--
2,4,6-Trichlorophenol	88-06-2	8	0	0%	--	--	10	11	--	--
2,4-Dichlorophenol	120-83-2	8	0	0%	--	--	10	11	--	--
2,4-Dimethylphenol	105-67-9	8	0	0%	--	--	10	11	--	--
2,4-Dinitrophenol	51-28-5	8	0	0%	--	--	25	28	--	--
2,4-Dinitrotoluene	121-14-2	8	0	0%	--	--	10	11	--	--
2,6-Dinitrotoluene	606-20-2	8	0	0%	--	--	10	11	--	--
2-Chloronaphthalene	91-58-7	8	0	0%	--	--	10	11	--	--
2-Chlorophenol	95-57-8	8	0	0%	--	--	10	11	--	--
2-Methylnaphthalene	91-57-6	8	0	0%	--	--	10	11	--	--
2-Methylphenol	95-48-7	8	0	0%	--	--	10	11	--	--
2-Nitroaniline	88-74-4	8	0	0%	--	--	25	28	--	--
2-Nitrophenol	88-75-5	8	0	0%	--	--	10	11	--	--
3,3'-Dichlorobenzidine	91-94-1	8	0	0%	--	--	10	11	--	--
3-Nitroaniline	99-09-2	8	0	0%	--	--	25	28	--	--
4,6-Dinitro-2-methylphenol	534-52-1	8	0	0%	--	--	25	28	--	--
4-Bromophenyl phenyl ether	101-55-3	8	0	0%	--	--	10	11	--	--
4-Chloro-3-methylphenol	59-50-7	8	0	0%	--	--	10	11	--	--
4-Chloroaniline	106-47-8	8	0	0%	--	--	10	11	--	--
4-Chlorophenyl phenyl ether	7005-72-3	8	0	0%	--	--	10	11	--	--
4-Methylphenol	106-44-5	8	0	0%	--	--	10	11	--	--
4-Nitroaniline	100-01-6	8	0	0%	--	--	25	28	--	--
4-Nitrophenol	100-02-7	8	0	0%	--	--	25	28	--	--
Acenaphthene	83-32-9	8	0	0%	--	--	10	11	--	--
Acenaphthylene	208-96-8	8	0	0%	--	--	10	11	--	--
Anthracene	120-12-7	8	0	0%	--	--	10	11	--	--
Benzo(a)anthracene	56-55-3	8	0	0%	--	--	10	11	--	--
Benzo(a)pyrene	50-32-8	8	0	0%	--	--	10	11	--	--
Benzo(b)fluoranthene	205-99-2	8	0	0%	--	--	10	11	--	--
Benzo(ghi)perylene	191-24-2	8	0	0%	--	--	10	11	--	--
Benzo(k)fluoranthene	207-08-9	8	0	0%	--	--	10	11	--	--

Table 1.4
Summary of Detections and Preliminary Screening Values
Groundwater, All Wells Combined
Seneca Army Depot Activity

Analyte Name	CAS Number	Total Number of Samples	Number of samples with Detected Concentrations	Frequency of Detection	Minimum Detection Limit (µg/L)	Maximum Detection Limit (µg/L)	Minimum Method Detection Limit (µg/L)	Maximum Method Detection Limit (µg/L)	Regional Screening Level [1] (µg/L)	Number of Detected Samples Greater than RSL
Bis(2-Chloroethoxy)methane	111-91-1	8	0	0%	--	--	10	11	--	--
Bis(2-Chloroethyl)ether	111-44-4	8	0	0%	--	--	10	11	--	--
Bis(2-Ethylhexyl)phthalate	117-81-7	8	4	50%	11	33	10	11	5.6	4
Butylbenzylphthalate	85-68-7	8	0	0%	--	--	10	11	--	--
Carbazole	86-74-8	8	0	0%	--	--	10	11	--	--
Chrysene	218-01-9	8	0	0%	--	--	10	11	--	--
Dibenz(a,h)anthracene	53-70-3	8	0	0%	--	--	10	11	--	--
Dibenzofuran	132-64-9	8	0	0%	--	--	10	11	--	--
Diethyl phthalate	84-66-2	8	0	0%	--	--	10	11	--	--
Dimethylphthalate	na	8	0	0%	--	--	10	11	--	--
Di-n-butylphthalate	84-74-2	8	0	0%	--	--	10	11	--	--
Di-n-octylphthalate	117-84-0	8	0	0%	--	--	10	11	--	--
Fluoranthene	206-44-0	8	0	0%	--	--	10	11	--	--
Fluorene	86-73-7	8	0	0%	--	--	10	11	--	--
Hexachlorobenzene	118-74-1	8	0	0%	--	--	10	11	--	--
Hexachlorobutadiene	87-68-3	8	0	0%	--	--	10	11	--	--
Hexachlorocyclopentadiene	77-47-4	8	0	0%	--	--	10	11	--	--
Hexachloroethane	67-72-1	8	0	0%	--	--	10	11	--	--
Indeno(1,2,3-cd)pyrene	193-39-5	8	0	0%	--	--	10	11	--	--
Isophorone	78-59-1	8	0	0%	--	--	10	11	--	--
Naphthalene	91-20-3	8	0	0%	--	--	10	11	--	--
Nitrobenzene	98-95-3	8	0	0%	--	--	10	11	--	--
N-Nitroso-di-n-propylamine	86-30-6	8	0	0%	--	--	10	11	--	--
N-Nitrosodiphenylamine	621-64-7	8	0	0%	--	--	10	11	--	--
Pentachlorophenol	87-86-5	8	0	0%	--	--	25	28	--	--
Phenanthrene	85-01-8	8	0	0%	--	--	10	11	--	--
Phenol	108-95-2	8	0	0%	--	--	10	11	--	--
Pyrene	129-00-0	8	0	0%	--	--	10	11	--	--
Herbicides										
2,4,5-T	93-76-5	8	0	0%	--	--	0.11	0.12	--	--
2,4,5-TP/Silvex	93-72-1	8	0	0%	--	--	0.11	0.12	--	--
2,4-D	94-75-7	8	0	0%	--	--	1.1	1.2	--	--
2,4-DB	94-82-6	8	0	0%	--	--	1.1	1.2	--	--
Dalapon	75-99-0	8	0	0%	--	--	2.4	2.7	--	--
Dicamba	1918-00-9	8	0	0%	--	--	0.11	0.12	--	--
Dichloroprop	na	8	0	0%	--	--	1.1	1.2	--	--
Dinoseb	88-85-7	8	0	0%	--	--	0.52	0.59	--	--
MCPA	94-74-6	8	0	0%	--	--	110	120	--	--
MCPP	93-65-2	8	0	0%	--	--	110	120	--	--
Explosives										
1,3,5-Trinitrobenzene	99-35-4	8	0	0%	--	--	0.13	0.13	--	--
1,3-Dinitrobenzene	99-65-0	8	1	13%	0.067	0.067	0.067	0.13	0.2	0
2,4,6-Trinitrotoluene	118-96-7	8	0	0%	--	--	0.13	0.13	--	--
2,4-Dinitrotoluene	121-14-2	8	0	0%	--	--	0.13	0.13	--	--
2,6-Dinitrotoluene	606-20-2	8	0	0%	--	--	0.13	0.13	--	--
2-amino-4,6-Dinitrotoluene	35572-78-2	8	0	0%	--	--	0.13	0.13	--	--
4-amino-2,6-Dinitrotoluene	19406-51-0	8	0	0%	--	--	0.13	0.13	--	--
HMX	2691-41-0	8	1	13%	0.5	0.5	0.13	0.13	100	0
RDX	121-82-4	8	0	0%	--	--	0.13	0.13	--	--
Tetryl	479-45-8	8	0	0%	--	--	0.13	0.13	--	--
Pesticides/PCBs										
4,4'-DDD	72-54-8	8	0	0%	--	--	0.1	0.14	--	--
4,4'-DDE	72-55-9	8	0	0%	--	--	0.1	0.14	--	--
4,4'-DDT	50-29-3	8	0	0%	--	--	0.1	0.14	--	--
Aldrin	309-00-2	8	0	0%	--	--	0.052	0.068	--	--
Alpha-BHC	319-84-6	8	0	0%	--	--	0.052	0.068	--	--
Alpha-Chlordane	5103-71-9	8	0	0%	--	--	0.052	0.068	--	--
Aroclor-1016	12674-11-2	8	0	0%	--	--	1	1.4	--	--
Aroclor-1221	11104-28-2	8	0	0%	--	--	2.1	2.7	--	--
Aroclor-1232	11141-16-5	8	0	0%	--	--	1	1.4	--	--
Aroclor-1242	53469-21-9	8	0	0%	--	--	1	1.4	--	--
Aroclor-1248	12672-29-6	8	0	0%	--	--	1	1.4	--	--
Aroclor-1254	11097-69-1	8	0	0%	--	--	1	1.4	--	--
Aroclor-1260	11096-82-5	8	0	0%	--	--	1	1.4	--	--
Beta-BHC	319-85-7	8	0	0%	--	--	0.052	0.068	--	--
Delta-BHC	na	8	0	0%	--	--	0.052	0.068	--	--
Dieldrin	60-57-1	8	0	0%	--	--	0.1	0.14	--	--
Endosulfan I	115-29-7	8	0	0%	--	--	0.052	0.068	--	--
Endosulfan II	33213-65-9	8	0	0%	--	--	0.1	0.14	--	--
Endosulfan sulfate	1031-07-8	8	0	0%	--	--	0.1	0.14	--	--
Endrin	72-20-8	8	0	0%	--	--	0.1	0.14	--	--

Table 1.4
Summary of Detections and Preliminary Screening Values
Groundwater, All Wells Combined
Seneca Army Depot Activity

Analyte Name	CAS Number	Total Number of Samples	Number of samples with Detected Concentrations	Frequency of Detection	Minimum Detection Limit (µg/L)	Maximum Detection Limit (µg/L)	Minimum Method Detection Limit (µg/L)	Maximum Method Detection Limit (µg/L)	Regional Screening Level (1) (µg/L)	Number of Detected Samples Greater than RSL
Endrin aldehyde	7421-93-4	8	0	0%	--	--	0.1	0.14	--	--
Endrin ketone	53494-70-5	8	0	0%	--	--	0.1	0.14	--	--
Gamma-BHC/Lindane	58-89-9	8	0	0%	--	--	0.052	0.068	--	--
Gamma-Chlordane	5103-74-2	8	0	0%	--	--	0.052	0.068	--	--
Heptachlor	76-44-8	8	0	0%	--	--	0.052	0.068	--	--
Heptachlor epoxide	1024-57-3	8	0	0%	--	--	0.052	0.068	--	--
Methoxychlor	72-43-5	8	0	0%	--	--	0.52	0.68	--	--
Toxaphene	8001-35-2	8	0	0%	--	--	5.2	6.8	--	--
Inorganics										
Aluminum	7429-90-5	12	9	75%	36.8	63300	14.3	42	2000	3
Antimony	7440-36-0	12	7	58%	23.1	52.1	2.2	21.6	0.78	7
Arsenic	7440-38-2	12	3	25%	1.7	9.5	1.4	3.6	0.052	3
Barium	7440-39-3	12	12	100%	23.4	751	--	--	380	1
Beryllium	7440-41-7	12	3	25%	0.52	5	0.1	2	2.5	1
Cadmium	7440-43-9	12	4	33%	2.2	3.8	0.3	4	0.92	4
Calcium	14452-75-6	12	12	100%	91700	660000	0	0	N/A	0
Chromium	18540-29-9	12	5	42%	2.6	106	0.7	2.6	0.035	5
Cobalt	7440-48-4	12	4	33%	5.3	94.4	1.4	4.4	0.6	4
Copper	7440-50-8	68	7	10%	1.5	123	0.63	25	80	1
Cyanide	57-12-5	11	0	0%	--	--	5	10	--	--
Iron	7439-89-6	12	10	83%	48.5	113000	25.4	25.4	1400	3
Iron+Manganese	N/A	12	12	100%	13.7	117640	--	--	N/A	0
Lead	7439-92-1	68	8	22%	0.66	75.6	0.9	5	15	2
Magnesium	7439-95-4	12	12	100%	15700	77900	--	--	N/A	0
Manganese	7439-96-5	12	12	100%	1	4640	--	--	43	5
Mercury	7487-94-7	12	3	25%	0.08	1.8	0.04	0.2	0.57	1
Nickel	7440-02-0	12	5	42%	2.2	209	1.4	4	39	2
Potassium	7440-09-7	12	9	75%	1050	18700	904	910	N/A	0
Selenium	7782-49-2	12	5	42%	0.99	2.5	0.7	3.1	10	0
Silver	7440-22-4	12	2	17%	0.98	4.6	0.9	4.2	9.4	0
Sodium	7440-23-5	12	12	100%	3400	40000	--	--	N/A	0
Thallium	7440-28-0	12	1	8%	3.4	3.4	1.2	4	0.02	1
Vanadium	7440-62-2	12	3	25%	11.7	93.1	1.2	3.7	8.6	3
Zinc	7440-66-6	12	12	100%	5.1	321	--	--	600	0

(1) USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.
-- = Not detected in any sample.
N/A = RSL not available.
na = CAS number not available.

Table 1.5
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Upstream of OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [(1)] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
Volatile Organic Compounds						
1,1,1-Trichloroethane	0	0	0%	0	--	0
1,1,2,2-Tetrachloroethane	0	0	0%	0	--	0
1,1,2-Trichloroethane	0	0	0%	0	--	0
1,1-Dichloroethane	0	0	0%	0	--	0
1,1-Dichloroethene	0	0	0%	0	--	0
1,2-Dibromo-3-chloropropane	0	0	0%	0	--	0
1,2-Dibromoethane	0	0	0%	0	--	0
1,2-Dichlorobenzene	0	0	0%	0	--	0
1,2-Dichloroethane	1	0	0%	0	--	0
1,2-Dichloroethene (total)	0	0	0%	0	--	0
1,2-Dichloropropane	0	0	0%	0	--	0
1,3-Dichlorobenzene	0	0	0%	0	--	0
1,4-Dichlorobenzene	0	0	0%	0	--	0
Acetone	1	0	0%	0	--	0
Benzene	0	0	0%	0	--	0
Bromochloromethane	0	0	0%	0	--	0
Bromodichloromethane	0	0	0%	0	--	0
Bromoform	0	0	0%	0	--	0
Carbon disulfide	1	0	0%	0	--	0
Carbon tetrachloride	0	0	0%	0	--	0
Chlorobenzene	0	0	0%	0	--	0
Chlorodibromomethane	0	0	0%	0	--	0
Chloroethane	0	0	0%	0	--	0
Chloroform	0	0	0%	0	--	0
Cis-1,2-Dichloroethene	0	0	0%	0	--	0
Cis-1,3-Dichloropropene	0	0	0%	0	--	0
Ethyl benzene	0	0	0%	0	--	0
Methyl bromide	0	0	0%	0	--	0
Methyl butyl ketone	0	0	0%	0	--	0
Methyl chloride	1	0	0%	0	--	0
Methyl ethyl ketone	0	0	0%	0	--	0
Methyl isobutyl ketone	0	0	0%	0	--	0
Methylene chloride	0	0	0%	0	--	0
Styrene	0	0	0%	0	--	0
Tetrachloroethene	0	0	0%	0	--	0
Toluene	0	0	0%	0	--	0
Total Xylenes	0	0	0%	0	--	0
Trans-1,2-Dichloroethene	0	0	0%	0	--	0
Trans-1,3-Dichloropropene	0	0	0%	0	--	0
Trichloroethene	1	0	0%	0	--	0
Vinyl chloride	0	0	0%	0	--	0
Semi Volatile Organic Compounds						
1,2,4-Trichlorobenzene	0	0	0%	0	--	0
1,2-Dichlorobenzene	0	0	0%	0	--	0
1,3-Dichlorobenzene	0	0	0%	0	--	0
1,4-Dichlorobenzene	0	0	0%	0	--	0
2,2'-oxybis(1-Chloropropane)	0	0	0%	0	--	0
2,4,5-Trichlorophenol	0	0	0%	0	--	0
2,4,6-Trichlorophenol	0	0	0%	0	--	0
2,4-Dichlorophenol	0	0	0%	0	--	0
2,4-Dimethylphenol	0	0	0%	0	--	0
2,4-Dinitrophenol	0	0	0%	0	--	0
2,4-Dinitrotoluene	0	0	0%	0	--	0
2,6-Dinitrotoluene	0	0	0%	0	--	0
2-Chloronaphthalene	0	0	0%	0	--	0
2-Chlorophenol	0	0	0%	0	--	0
2-Methylnaphthalene	0	0	0%	0	--	0
2-Methylphenol	0	0	0%	0	--	0
2-Nitroaniline	0	0	0%	0	--	0
2-Nitrophenol	0	0	0%	0	--	0
3,3'-Dichlorobenzidine	0	0	0%	0	--	0
3-Nitroaniline	0	0	0%	0	--	0
4,6-Dinitro-2-methylphenol	0	0	0%	0	--	0
4-Bromophenyl phenyl ether	0	0	0%	0	--	0
4-Chloro-3-methylphenol	0	0	0%	0	--	0
4-Chloroaniline	0	0	0%	0	--	0
4-Chlorophenyl phenyl ether	0	0	0%	0	--	0
4-Methylphenol	0	0	0%	0	--	0
4-Nitroaniline	0	0	0%	0	--	0

Table 1.5
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Upstream of OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) (1) (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
4-Nitrophenol	0	0	0%	0	--	0
Acenaphthene	0	0	0%	0	--	0
Acenaphthylene	0	0	0%	0	--	0
Anthracene	0	0	0%	0	--	0
Benzo(a)anthracene	0	0	0%	0	--	0
Benzo(a)pyrene	0	0	0%	0	--	0
Benzo(b)fluoranthene	0	0	0%	0	--	0
Benzo(ghi)perylene	0	0	0%	0	--	0
Benzo(k)fluoranthene	0	0	0%	0	--	0
Bis(2-Chloroethoxy)methane	0	0	0%	0	--	0
Bis(2-Chloroethyl)ether	0	0	0%	0	--	0
Bis(2-Chloroisopropyl)ether	0	0	0%	0	--	0
Bis(2-Ethylhexyl)phthalate	1	0	0%	0	--	0
Butylbenzylphthalate	0	0	0%	0	--	0
Carbazole	0	0	0%	0	--	0
Chrysene	0	0	0%	0	--	0
Di-n-butylphthalate	0	0	0%	0	--	0
Di-n-octylphthalate	0	0	0%	0	--	0
Dibenz(a,h)anthracene	0	0	0%	0	--	0
Dibenzofuran	0	0	0%	0	--	0
Diethyl phthalate	0	0	0%	0	--	0
Dimethylphthalate	0	0	0%	0	--	0
Fluoranthene	0	0	0%	0	--	0
Fluorene	0	0	0%	0	--	0
Hexachlorobenzene	0	0	0%	0	--	0
Hexachlorobutadiene	0	0	0%	0	--	0
Hexachlorocyclopentadiene	0	0	0%	0	--	0
Hexachloroethane	0	0	0%	0	--	0
Indeno(1,2,3-cd)pyrene	0	0	0%	0	--	0
Isophorone	0	0	0%	0	--	0
N-Nitrosodiphenylamine	0	0	0%	0	--	0
N-Nitrosodipropylamine	0	0	0%	0	--	0
Naphthalene	0	0	0%	0	--	0
Nitrobenzene	0	0	0%	0	--	0
Pentachlorophenol	0	0	0%	0	--	0
Phenanthrene	0	0	0%	0	--	0
Phenol	0	0	0%	0	--	0
Pyrene	0	0	0%	0	--	0
Herbicides						
2,4,5-T	0	0	0%	0	--	0
2,4,5-TP/Silvex	0	0	0%	0	--	0
2,4-D	0	0	0%	0	--	0
2,4-DB	0	0	0%	0	--	0
Dalapon	0	0	0%	0	--	0
Dicamba	0	0	0%	0	--	0
Dichloroprop	0	0	0%	0	--	0
Dinoseb	0	0	0%	0	--	0
MCPA	0	0	0%	0	--	0
MCPP	0	0	0%	0	--	0
Explosives						
1,3,5-Trinitrobenzene	0	0	0%	0	--	0
1,3-Dinitrobenzene	0	0	0%	0	--	0
2,4,6-Trinitrotoluene	0	0	0%	0	--	0
2,4-Dinitrotoluene	0	0	0%	0	--	0
2,6-Dinitrotoluene	0	0	0%	0	--	0
2-amino-4,6-Dinitrotoluene	0	0	0%	0	--	0
4-amino-2,6-Dinitrotoluene	0	0	0%	0	--	0
HMX	0	0	0%	0	--	0
RDX	1	0	0%	0	--	0
Tetryl	1	0	0%	0	--	0
PESTICIDES/PCBS						
4,4'-DDD	0	0	0%	0	--	0
4,4'-DDE	0	0	0%	0	--	0
4,4'-DDT	0	0	0%	0	--	0
Aldrin	0	0	0%	0	--	0
Alpha-BHC	0	0	0%	0	--	0
Alpha-Chlordane	0	0	0%	0	--	0
Aroclor-1016	0	0	0%	0	--	0
Aroclor-1221	0	0	0%	0	--	0
Aroclor-1232	0	0	0%	0	--	0

Table 1.5
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Upstream of OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [(1)] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
Aroclor-1242	0	0	0%	0	--	0
Aroclor-1248	0	0	0%	0	--	0
Aroclor-1254	0	0	0%	0	--	0
Aroclor-1260	0	0	0%	0	--	0
Beta-BHC	0	0	0%	0	--	0
Delta-BHC	0	0	0%	0	--	0
Dieldrin	0	0	0%	0	--	0
Endosulfan I	0	0	0%	0	--	0
Endosulfan II	0	0	0%	0	--	0
Endosulfan sulfate	0	0	0%	0	--	0
Endrin	0	0	0%	0	--	0
Endrin aldehyde	0	0	0%	0	--	0
Endrin ketone	0	0	0%	0	--	0
Gamma-BHC/Lindane	0	0	0%	0	--	0
Gamma-Chlordane	0	0	0%	0	--	0
Heptachlor	0	0	0%	0	--	0
Heptachlor epoxide	0	0	0%	0	--	0
Hexachlorobenzene	0	0	0%	0	--	0
Methoxychlor	0	0	0%	0	--	0
Toxaphene	0	0	0%	0	--	0
Inorganics						
Aluminum	10	9	90%	140	2000	0
Antimony	9	0	0%	0	--	0
Arsenic	10	0	0%	0	0.052	0
Barium	10	9	90%	48.3	380	0
Beryllium	10	0	0%	0	2.5	0
Cadmium	9	2	22%	0.88	0.92	0
Calcium	10	10	100%	85500	NA	0
Chromium	10	0	0%	0	0.035	0
Cobalt	9	0	0%	0	0.6	0
Copper	10	1	10%	3	80	0
Cyanide	10	1	10%	10	0.15	0
Iron	10	10	100%	184	1400	0
Lead	10	0	0%	0	--	0
Magnesium	10	10	100%	12900	NA	0
Manganese	9	9	100%	69.4	43	0
Mercury	10	0	0%	0	0.57	0
Nickel	10	0	0%	0	39	0
Potassium	10	10	100%	3710	NA	0
Selenium	10	0	0%	0	10	0
Silver	9	0	0%	0	--	0
Sodium	10	10	100%	59100	NA	2
Thallium	9	0	0%	0	--	0
Vanadium	10	1	10%	39.2	8.6	1
Zinc	10	10	100%	14.3	600	0

(1) USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.
-- = Not detected in any sample.
NA = RSL not available.

Table 1.6
Summary of Detections and Preliminary Screening Values
Surface Water, Drainage Ditches from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) (1) (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
Volatile Organic Compounds						
1,1,1-Trichloroethane	4	0	0%	0	--	0
1,1,2,2-Tetrachloroethane	4	0	0%	0	--	0
1,1,2-Trichloroethane	4	0	0%	0	--	0
1,1-Dichloroethane	4	0	0%	0	--	0
1,1-Dichloroethene	4	0	0%	0	--	0
1,2-Dibromo-3-chloropropane	0	0	0%	0	--	0
1,2-Dibromoethane	0	0	0%	0	--	0
1,2-Dichlorobenzene	0	0	0%	0	--	0
1,2-Dichloroethane	4	0	0%	0	--	0
1,2-Dichloroethene (total)	4	0	0%	0	--	0
1,2-Dichloropropane	4	0	0%	0	--	0
1,3-Dichlorobenzene	0	0	0%	0	--	0
1,4-Dichlorobenzene	0	0	0%	0	--	0
Acetone	4	0	0%	0	--	0
Benzene	4	0	0%	0	--	0
Bromochloromethane	0	0	0%	0	--	0
Bromodichloromethane	4	0	0%	0	--	0
Bromoform	4	0	0%	0	--	0
Carbon disulfide	4	0	0%	0	--	0
Carbon tetrachloride	4	0	0%	0	--	0
Chlorobenzene	4	0	0%	0	--	0
Chlorodibromomethane	4	0	0%	0	--	0
Chloroethane	4	0	0%	0	--	0
Chloroform	4	0	0%	0	--	0
Cis-1,2-Dichloroethene	0	0	0%	0	--	0
Cis-1,3-Dichloropropene	4	0	0%	0	--	0
Ethyl benzene	4	0	0%	0	--	0
Methyl bromide	4	0	0%	0	--	0
Methyl butyl ketone	4	0	0%	0	--	0
Methyl chloride	4	0	0%	0	--	0
Methyl ethyl ketone	4	0	0%	0	--	0
Methyl isobutyl ketone	4	0	0%	0	--	0
Methylene chloride	4	0	0%	0	--	0
Styrene	4	0	0%	0	--	0
Tetrachloroethene	4	0	0%	0	--	0
Toluene	4	0	0%	0	--	0
Total Xylenes	4	0	0%	0	--	0
Trans-1,2-Dichloroethene	0	0	0%	0	--	0
Trans-1,3-Dichloropropene	4	0	0%	0	--	0
Trichloroethene	4	0	0%	0	--	0
Vinyl chloride	4	0	0%	0	--	0
Semi Volatile Organic Compounds						
1,2,4-Trichlorobenzene	4	0	0%	0	--	0
1,2-Dichlorobenzene	4	0	0%	0	--	0
1,3-Dichlorobenzene	4	0	0%	0	--	0
1,4-Dichlorobenzene	4	0	0%	0	--	0
2,2'-oxybis(1-Chloropropane)	4	0	0%	0	--	0
2,4,5-Trichlorophenol	4	0	0%	0	--	0
2,4,6-Trichlorophenol	4	0	0%	0	--	0
2,4-Dichlorophenol	4	0	0%	0	--	0
2,4-Dimethylphenol	4	0	0%	0	--	0
2,4-Dinitrophenol	4	0	0%	0	--	0
2,4-Dinitrotoluene	4	0	0%	0	--	0
2,6-Dinitrotoluene	4	0	0%	0	--	0
2-Chloronaphthalene	4	0	0%	0	--	0
2-Chlorophenol	4	0	0%	0	--	0
2-Methylnaphthalene	4	0	0%	0	--	0
2-Methylphenol	4	0	0%	0	--	0
2-Nitroaniline	4	0	0%	0	--	0
2-Nitrophenol	4	0	0%	0	--	0
3,3'-Dichlorobenzidine	4	0	0%	0	--	0
3-Nitroaniline	4	0	0%	0	--	0
4,6-Dinitro-2-methylphenol	4	0	0%	0	--	0
4-Bromophenyl phenyl ether	4	0	0%	0	--	0
4-Chloro-3-methylphenol	4	0	0%	0	--	0
4-Chloroaniline	4	0	0%	0	--	0
4-Chlorophenyl phenyl ether	4	0	0%	0	--	0
4-Methylphenol	4	0	0%	0	--	0

Table 1.6
Summary of Detections and Preliminary Screening Values
Surface Water, Drainage Ditches from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [(1)] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
4-Nitroaniline	4	0	0%	0	--	0
4-Nitrophenol	4	0	0%	0	--	0
Acenaphthene	4	0	0%	0	--	0
Acenaphthylene	4	0	0%	0	--	0
Anthracene	4	0	0%	0	--	0
Benzo(a)anthracene	4	0	0%	0	--	0
Benzo(a)pyrene	4	0	0%	0	--	0
Benzo(b)fluoranthene	4	0	0%	0	--	0
Benzo(ghi)perylene	4	0	0%	0	--	0
Benzo(k)fluoranthene	4	0	0%	0	--	0
Bis(2-Chloroethoxy)methane	4	0	0%	0	--	0
Bis(2-Chloroethyl)ether	4	0	0%	0	--	0
Bis(2-Chloroisopropyl)ether	4	0	0%	0	--	0
Bis(2-Ethylhexyl)phthalate	0	0	0%	0	--	0
Butylbenzylphthalate	4	0	0%	0	--	0
Carbazole	4	0	0%	0	--	0
Chrysene	4	0	0%	0	--	0
Di-n-butylphthalate	4	0	0%	0	--	0
Di-n-octylphthalate	4	0	0%	0	--	0
Dibenz(a,h)anthracene	4	0	0%	0	--	0
Dibenzofuran	4	0	0%	0	--	0
Diethyl phthalate	4	0	0%	0	--	0
Dimethylphthalate	4	0	0%	0	--	0
Fluoranthene	4	0	0%	0	--	0
Fluorene	4	0	0%	0	--	0
Hexachlorobenzene	4	0	0%	0	--	0
Hexachlorobutadiene	4	0	0%	0	--	0
Hexachlorocyclopentadiene	4	0	0%	0	--	0
Hexachloroethane	4	0	0%	0	--	0
Indeno(1,2,3-cd)pyrene	4	0	0%	0	--	0
Isophorone	4	0	0%	0	--	0
N-Nitrosodiphenylamine	4	0	0%	0	--	0
N-Nitrosodipropylamine	4	0	0%	0	--	0
Naphthalene	4	0	0%	0	--	0
Nitrobenzene	4	0	0%	0	--	0
Pentachlorophenol	4	0	0%	0	--	0
Phenanthrene	4	0	0%	0	--	0
Phenol	4	0	0%	0	--	0
Pyrene	4	0	0%	0	--	0
Herbicides						
2,4,5-T	4	0	0%	0	--	0
2,4,5-TP/Silvex	4	0	0%	0	--	0
2,4-D	4	0	0%	0	--	0
2,4-DB	4	0	0%	0	--	0
Dalapon	4	0	0%	0	--	0
Dicamba	4	0	0%	0	--	0
Dichloroprop	4	0	0%	0	--	0
Dinoseb	4	0	0%	0	--	0
MCPA	4	0	0%	0	--	0
MCPP	4	0	0%	0	--	0
Explosives						
1,3,5-Trinitrobenzene	4	0	0%	0	--	0
1,3-Dinitrobenzene	4	0	0%	0	--	0
2,4,6-Trinitrotoluene	4	0	0%	0	--	0
2,4-Dinitrotoluene	4	0	0%	0	--	0
2,6-Dinitrotoluene	4	0	0%	0	--	0
2-amino-4,6-Dinitrotoluene	4	0	0%	0	--	0

Table 1.6
Summary of Detections and Preliminary Screening Values
Surface Water, Drainage Ditches from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [1] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
4-amino-2,6-Dinitrotoluene	4	0	0%	0	--	0
HMX	4	2	50%	0.49	100	0
RDX	4	2	50%	2	0.7	1
Tetryl	4	0	0%	0	--	0
PESTICIDES/PCBS						
4,4'-DDD	4	0	0%	0	--	0
4,4'-DDE	4	0	0%	0	--	0
4,4'-DDT	4	0	0%	0	--	0
Aldrin	4	0	0%	0	--	0
Alpha-BHC	4	0	0%	0	--	0
Alpha-Chlordane	4	0	0%	0	--	0
Aroclor-1016	4	0	0%	0	--	0
Aroclor-1221	4	0	0%	0	--	0
Aroclor-1232	4	0	0%	0	--	0
Aroclor-1242	4	0	0%	0	--	0
Aroclor-1248	4	0	0%	0	--	0
Aroclor-1254	4	0	0%	0	--	0
Aroclor-1260	4	0	0%	0	--	0
Beta-BHC	4	0	0%	0	--	0
Delta-BHC	4	0	0%	0	--	0
Dieldrin	4	0	0%	0	--	0
Endosulfan I	4	0	0%	0	--	0
Endosulfan II	4	0	0%	0	--	0
Endosulfan sulfate	4	0	0%	0	--	0
Endrin	4	0	0%	0	--	0
Endrin aldehyde	4	0	0%	0	--	0
Endrin ketone	4	0	0%	0	--	0
Gamma-BHC/Lindane	4	0	0%	0	--	0
Gamma-Chlordane	4	0	0%	0	--	0
Heptachlor	4	0	0%	0	--	0
Heptachlor epoxide	4	0	0%	0	--	0
Hexachlorobenzene	0	0	0%	0	--	0
Methoxychlor	4	0	0%	0	--	0
Toxaphene	4	0	0%	0	--	0
Inorganics						
Aluminum	4	4	100%	37500	2000	3
Antimony	4	0	0%	0	--	0
Arsenic	4	1	25%	2.3	0.052	0
Barium	4	4	100%	439	380	0
Beryllium	4	2	50%	1.5	2.5	0
Cadmium	4	1	25%	11.2	0.92	1
Calcium	4	4	100%	194000	NA	0
Chromium	4	3	75%	50.8	0.035	1
Cobalt	4	2	50%	18.2	0.6	2
Copper	4	4	100%	612	80	2
Cyanide	4	1	25%	47.7	0.15	0
Iron	4	4	100%	60400	1400	4
Lead	4	4	100%	68.7	15 [2]	2
Magnesium	4	4	100%	24300	NA	0
Manganese	4	4	100%	1250	43	2
Mercury	4	4	100%	3	0.57	1
Nickel	4	4	100%	74.2	39	0
Potassium	4	4	100%	9670	NA	0
Selenium	4	0	0%	0	--	0
Silver	4	0	0%	0	--	0
Sodium	4	4	100%	4340	NA	0
Thallium	4	0	0%	0	--	0
Vanadium	4	3	75%	54.9	8.6	2
Zinc	4	4	100%	883	600	1

[1] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

[2] RSL not available. Used the Maximum Contaminant Level for lead.
-- = Not detected in any sample.
NA = RSL not available.

Table 1.7
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Onsite and Downstream from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) (1) (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
Volatile Organic Compounds						
1,1,1-Trichloroethane	6	0	0%	0	--	0
1,1,2,2-Tetrachloroethane	6	0	0%	0	--	0
1,1,2-Trichloroethane	6	0	0%	0	--	0
1,1-Dichloroethane	6	0	0%	0	--	0
1,1-Dichloroethene	6	0	0%	0	--	0
1,2-Dibromo-3-chloropropane	6	0	0%	0	--	0
1,2-Dibromoethane	6	0	0%	0	--	0
1,2-Dichlorobenzene	6	0	0%	0	--	0
1,2-Dichloroethane	16	1	6%	2	0.17	1
1,2-Dichloroethene (total)	0	0	0%	0	--	0
1,2-Dichloropropane	6	0	0%	0	--	0
1,3-Dichlorobenzene	6	0	0%	0	--	0
1,4-Dichlorobenzene	6	0	0%	0	--	0
Acetone	16	1	6%	10	1400	0
Benzene	6	0	0%	0	--	0
Bromochloromethane	6	0	0%	0	--	0
Bromodichloromethane	6	0	0%	0	--	0
Bromoform	6	0	0%	0	--	0
Carbon disulfide	16	0	0%	0	--	0
Carbon tetrachloride	6	0	0%	0	--	0
Chlorobenzene	6	0	0%	0	--	0
Chlorodibromomethane	6	0	0%	0	--	0
Chloroethane	6	0	0%	0	--	0
Chloroform	6	0	0%	0	--	0
Cis-1,2-Dichloroethene	6	0	0%	0	--	0
Cis-1,3-Dichloropropene	6	0	0%	0	--	0
Ethyl benzene	6	0	0%	0	--	0
Methyl bromide	6	0	0%	0	--	0
Methyl butyl ketone	6	0	0%	0	--	0
Methyl chloride	16	1	6%	8	19	0
Methyl ethyl ketone	6	0	0%	0	--	0
Methyl isobutyl ketone	6	0	0%	0	--	0
Methylene chloride	6	0	0%	0	--	0
Styrene	6	0	0%	0	--	0
Tetrachloroethene	6	0	0%	0	--	0
Toluene	6	0	0%	0	--	0
Total Xylenes	6	0	0%	0	--	0
Trans-1,2-Dichloroethene	6	0	0%	0	--	0
Trans-1,3-Dichloropropene	6	0	0%	0	--	0
Trichloroethene	16	0	0%	0	--	0
Vinyl chloride	6	0	0%	0	--	0
Semi Volatile Organic Compounds						
1,2,4-Trichlorobenzene	6	0	0%	0	--	0
1,2-Dichlorobenzene	6	0	0%	0	--	0
1,3-Dichlorobenzene	6	0	0%	0	--	0
1,4-Dichlorobenzene	6	0	0%	0	--	0
2,2'-oxybis(1-Chloropropane)	0	0	0%	0	--	0
2,4,5-Trichlorophenol	6	0	0%	0	--	0
2,4,6-Trichlorophenol	6	0	0%	0	--	0
2,4-Dichlorophenol	6	0	0%	0	--	0
2,4-Dimethylphenol	6	0	0%	0	--	0
2,4-Dinitrophenol	6	0	0%	0	--	0
2,4-Dinitrotoluene	6	0	0%	0	--	0
2,6-Dinitrotoluene	6	0	0%	0	--	0

Table 1.7
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Onsite and Downstream from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [1] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
2-Chloronaphthalene	6	0	0%	0	--	0
2-Chlorophenol	6	0	0%	0	--	0
2-Methylnaphthalene	6	0	0%	0	--	0
2-Methylphenol	6	0	0%	0	--	0
2-Nitroaniline	6	0	0%	0	--	0
2-Nitrophenol	6	0	0%	0	--	0
3,3'-Dichlorobenzidine	6	0	0%	0	--	0
3-Nitroaniline	6	0	0%	0	--	0
4,6-Dinitro-2-methylphenol	6	0	0%	0	--	0
4-Bromophenyl phenyl ether	6	0	0%	0	--	0
4-Chloro-3-methylphenol	6	0	0%	0	--	0
4-Chloroaniline	6	0	0%	0	--	0
4-Chlorophenyl phenyl ether	6	0	0%	0	--	0
4-Methylphenol	6	0	0%	0	--	0
4-Nitroaniline	6	0	0%	0	--	0
4-Nitrophenol	6	0	0%	0	--	0
Acenaphthene	6	0	0%	0	--	0
Acenaphthylene	6	0	0%	0	--	0
Anthracene	6	0	0%	0	--	0
Benzo(a)anthracene	6	0	0%	0	--	0
Benzo(a)pyrene	6	0	0%	0	--	0
Benzo(b)fluoranthene	6	0	0%	0	--	0
Benzo(ghi)perylene	6	0	0%	0	--	0
Benzo(k)fluoranthene	6	0	0%	0	--	0
Bis(2-Chloroethoxy)methane	6	0	0%	0	--	0
Bis(2-Chloroethyl)ether	6	0	0%	0	--	0
Bis(2-Chloroisopropyl)ether	6	0	0%	0	--	0
Bis(2-Ethylhexyl)phthalate	17	0	0%	0	--	0
Butylbenzylphthalate	6	2	33%	0.12	16	0
Carbazole	6	0	0%	0	--	0
Chrysene	6	0	0%	0	--	0
Di-n-butylphthalate	6	0	0%	0	--	0
Di-n-octylphthalate	6	0	0%	0	--	0
Dibenz(a,h)anthracene	6	0	0%	0	--	0
Dibenzofuran	6	0	0%	0	--	0
Diethyl phthalate	6	2	33%	0.072	1500	0
Dimethylphthalate	6	0	0%	0	--	0
Fluoranthene	6	0	0%	0	--	0
Fluorene	6	0	0%	0	--	0
Hexachlorobenzene	6	0	0%	0	--	0
Hexachlorobutadiene	6	0	0%	0	--	0
Hexachlorocyclopentadiene	6	0	0%	0	--	0
Hexachloroethane	6	0	0%	0	--	0
Indeno(1,2,3-cd)pyrene	6	0	0%	0	--	0
Isophorone	6	0	0%	0	--	0
N-Nitrosodiphenylamine	6	0	0%	0	--	0
N-Nitrosodipropylamine	6	0	0%	0	--	0
Naphthalene	6	0	0%	0	--	0
Nitrobenzene	6	0	0%	0	--	0
Pentachlorophenol	6	0	0%	0	--	0
Phenanthrene	6	0	0%	0	--	0
Phenol	6	0	0%	0	--	0
Pyrene	6	0	0%	0	--	0
Herbicides						
2,4,5-T	0	0	0%	0	--	0

Table 1.7
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Onsite and Downstream from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [1] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
2,4,5-TP/Silvex	0	0	0%	0	--	0
2,4-D	0	0	0%	0	--	0
2,4-DB	0	0	0%	0	--	0
Dalapon	0	0	0%	0	--	0
Dicamba	0	0	0%	0	--	0
Dichloroprop	0	0	0%	0	--	0
Dinoseb	0	0	0%	0	--	0
MCPA	0	0	0%	0	--	0
MCPP	0	0	0%	0	--	0
Explosives						
1,3,5-Trinitrobenzene	0	0	0%	0	--	0
1,3-Dinitrobenzene	0	0	0%	0	--	0
2,4,6-Trinitrotoluene	0	0	0%	0	--	0
2,4-Dinitrotoluene	0	0	0%	0	--	0
2,6-Dinitrotoluene	0	0	0%	0	--	0
2-amino-4,6-Dinitrotoluene	0	0	0%	0	--	0
4-amino-2,6-Dinitrotoluene	0	0	0%	0	--	0
HMX	0	0	0%	0	100	0
RDX	11	1	9%	0.67	0.7	0
Tetryl	11	0	0%	0	--	0
PESTICIDES/PCBS						
4,4'-DDD	6	0	0%	0	--	0
4,4'-DDE	6	0	0%	0	0.2	0
4,4'-DDT	6	0	0%	0	0.2	0
Aldrin	6	0	0%	0	0.0046	0
Alpha-BHC	6	0	0%	0	--	0
Alpha-Chlordane	6	0	0%	0	0.22	0
Aroclor-1016	6	0	0%	0	--	0
Aroclor-1221	6	0	0%	0	--	0
Aroclor-1232	6	0	0%	0	--	0
Aroclor-1242	6	0	0%	0	--	0
Aroclor-1248	6	0	0%	0	--	0
Aroclor-1254	6	0	0%	0	--	0
Aroclor-1260	6	0	0%	0	--	0
Beta-BHC	6	0	0%	0	0.04	0
Delta-BHC	6	0	0%	0	0.04	0
Dieldrin	6	0	0%	0	--	0
Endosulfan I	6	0	0%	0	--	0
Endosulfan II	6	0	0%	0	--	0
Endosulfan sulfate	6	0	0%	0	--	0
Endrin	6	0	0%	0	--	0
Endrin aldehyde	6	0	0%	0	5	0
Endrin ketone	6	0	0%	0	5	0
Gamma-BHC/Lindane	6	0	0%	0	--	0
Gamma-Chlordane	6	0	0%	0	--	0
Heptachlor	6	0	0%	0	0.04	0
Heptachlor epoxide	6	0	0%	0	0.03	0
Hexachlorobenzene	6	0	0%	0	--	0
Methoxychlor	6	0	0%	0	--	0
Toxaphene	6	0	0%	0	--	0
Inorganics						
Aluminum	14	4	29%	300	2000	0
Antimony	6	0	0%	0	--	0
Arsenic	16	0	0%	0	0.052	0
Barium	16	16	100%	66.6	380	0

Table 1.7
Summary of Detections and Preliminary Screening Values
Surface Water, Reeder Creek Onsite and Downstream from OD Grounds
Seneca Army Depot Activity

Analyte Name	Number of Samples	Number of samples with Detected Concentrations	Frequency of Samples with Detected Concentrations	Maximum Detected Concentration (µg/L)	Regional Screening Levels (RSL) [1] (µg/L)	Number of Samples with Detected Concentrations Exceeding Screening Criteria
Beryllium	16	4	25%	1.4	2.5	0
Cadmium	6	2	33%	0.45	0.92	0
Calcium	16	16	100%	121000	NA	0
Chromium	16	0	0%	0	0.035	0
Cobalt	6	0	0%	0	0.6	0
Copper	16	0	0%	0	80	0
Cyanide	16	1	6%	14.9	0.15	0
Iron	13	12	92%	737	1400	4
Lead	16	3	19%	2.2	15 [2]	0
Magnesium	16	16	100%	18700	NA	0
Manganese	16	16	100%	236	43	0
Mercury	16	1	6%	0.11	0.57	0
Nickel	16	0	0%	0	39	0
Potassium	13	13	100%	3800	NA	0
Selenium	16	3	19%	1.6	10	0
Silver	6	0	0%	0	--	0
Sodium	16	15	94%	26500	NA	6
Thallium	6	0	0%	0	--	0
Vanadium	16	0	0%	0	8.6	0
Zinc	11	5	45%	15.4	600	0

[1] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

[2] RSL not available. Used the Maximum Contaminant Level for lead.

-- = Not detected in any sample.

NA = RSL not available.

Section 2 Tables

Table 2.1
Human Health Risk Assessment Constituents of Potential Concern OD Hill Area
Surface Soil (0 - ≤2 feet bgs)
Seneca Army Depot Activity

Detected Analytes [1]	Units	Maximum Detected Concentration of Analytes	Regional Screening Level (RSL) [2]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?
Semivolatile Organic Compounds					
2,4-Dinitrotoluene	mg/kg	2.5	1.70	Yes	**Yes**
2,6-Dinitrotoluene	mg/kg	0.041	0.36	No	No
Acenaphthylene	mg/kg	0.03	350	No	No
Anthracene	mg/kg	0.018	1700	No	No
Benzo(a)anthracene	mg/kg	0.05	0.15	No	No
Benzo(a)pyrene	mg/kg	0.082	0.02	Yes	**Yes**
Benzo(b)fluoranthene	mg/kg	0.055	0.15	No	No
Benzo(ghi)perylene	mg/kg	0.048	NA [3]	NA	**Yes**
Benzo(k)fluoranthene	mg/kg	0.058	1.50	No	No
Bis(2-Ethylhexyl)phthalate	mg/kg	0.74	38.0	No	No
Chrysene	mg/kg	0.13	15.0	No	No
Di-n-butylphthalate	mg/kg	2.6	620	No	No
Fluoranthene	mg/kg	0.066	230	No	No
Hexachlorobenzene	mg/kg	0.11	0.33	No	No
Hexachloroethane	mg/kg	0.021	4.30	No	No
Indeno(1,2,3-cd)pyrene	mg/kg	0.052	0.15	No	No
Naphthalene	mg/kg	0.024	3.80	No	No
N-Nitrosodiphenylamine	mg/kg	0.32	110	No	No
N-Nitrosodipropylamine	mg/kg	0.11	0.08	Yes	**Yes**
Phenanthrene	mg/kg	0.038	NA [3]	NA	**Yes**
Pyrene	mg/kg	0.11	170	No	No
Explosives					
1,3,5-Trinitrobenzene	mg/kg	0.12	220	No	No
2,4,6-Trinitrotoluene	mg/kg	0.19	3.60	No	No
2,4-Dinitrotoluene	mg/kg	1.1	1.70	No	No
2-amino-4,6-Dinitrotoluene	mg/kg	0.59	15.0	No	No
4-amino-2,6-Dinitrotoluene	mg/kg	0.5	15.0	No	No
HMX	mg/kg	0.19	380.0	No	No
Nitroglycerine	mg/kg	1.5	0.62	Yes	**Yes**
RDX	mg/kg	1.8	6.0	No	No
Tetryl	mg/kg	0.33	12.0	No	No
Pesticides/PCBs					
Aroclor-1254	mg/kg	2	0.11	Yes	**Yes**
4,4'-DDD	mg/kg	0.0024	2.20	No	No
4,4'-DDE	mg/kg	0.012	1.60	No	No
4,4'-DDT	mg/kg	0.0034	1.90	No	No
Aldrin	mg/kg	0.0022	0.03	No	No
Alpha-Chlordane	mg/kg	0.0057	1.80 [4]	No	No
Dieldrin	mg/kg	0.0074	0.03	No	No
Endosulfan I	mg/kg	0.032	37.0	No	No
Endosulfan II	mg/kg	0.00088	37.0 [5]	No	No
Endrin	mg/kg	0.0036	1.80	No	No
Endrin aldehyde	mg/kg	0.0032	1.80 [6]	No	No
Endrin ketone	mg/kg	0.00058	1.80 [6]	No	No
Gamma-Chlordane	mg/kg	0.0011	1.80 [4]	No	No
Methoxychlor	mg/kg	0.045	31.0	No	No
Inorganics					
Aluminum	mg/kg	35000	7700	Yes	**Yes**
Antimony	mg/kg	3.10	3.10	No	No
Arsenic	mg/kg	16.1	0.67	Yes	**Yes**
Barium	mg/kg	308	1500	No	No
Beryllium	mg/kg	1.40	16.0	No	No
Cadmium	mg/kg	1100	7.0	Yes	**Yes**
Calcium	mg/kg	193000	NA [7]	NA	NA
Chromium	mg/kg	446	0.30 [8]	Yes	**Yes**
Cobalt	mg/kg	19.7	2.3	Yes	**Yes**
Copper	mg/kg	4180	310	Yes	**Yes**

Table 2.1
Human Health Risk Assessment Constituents of Potential Concern OD Hill Area
Surface Soil (0 - ≤2 feet bgs)
Seneca Army Depot Activity

Detected Analytes [1]	Units	Maximum Detected Concentration of Analytes	Regional Screening Level (RSL) [2]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?
Iron	mg/kg	118000	NA [7]	NA	NA
Lead	mg/kg	998	400	Yes	**Yes**
Magnesium	mg/kg	15000	NA [7]	NA	NA
Manganese	mg/kg	1080	180	Yes	**Yes**
Mercury	mg/kg	7.00	2.3	Yes	**Yes**
Nickel	mg/kg	67.7	150	No	No
Potassium	mg/kg	4880	NA [7]	NA	NA
Selenium	mg/kg	0.73	39.0	No	No
Silver	mg/kg	205	39.0	Yes	**Yes**
Sodium	mg/kg	377	NA [7]	NA	NA
Thallium	mg/kg	0.27	0.078	Yes	**Yes**
Vanadium	mg/kg	53.7	39.0	Yes	**Yes**
Zinc	mg/kg	1350	2300	No	No

[1] Analytes shown are those that are detected in any sample, from surface soil (0 - ≤ 2 feet bgs) from the exposure area.
[2] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.
[3] No RSL available, so the analyte is considered a COPC.

[4] No RSL exists for alpha-chlordane or gamma-chlordane, therefore the RSL for chlordane was used as a surrogate.
[5] No RSL exists for endosulfan II, therefore the RSL for endosulfan used as a surrogate.
[6] No RSL exists for endrin aldehyde or endrin ketone, therefore the RSL for endrin used as a surrogate.

[7] Calcium, Iron, Magnesium, Potassium, and Sodium are essential nutrients and are not expected to pose an unacceptable risk to human receptors
[8] No RSL exists for total chromium, therefore the more conservative RSL for chromium(VI) used.

NA = Not applicaple because essential nutrient.

Table 2.2
Human Health Risk Assessment Constituents of Potential Concern OD Hill Area
Combined Surface and Subsurface Soil (≤15 feet bgs)
Seneca Army Depot Activity

Analyte [1]	Units	Maximum Detected Concentration of Detected Analytes	Regional Screening Level (RSL) [2]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?
Volatile Organic Compounds					
Tetrachloroethene	mg/kg	0.019	8.10	No	No
Semivolatile Organic Compounds					
2,4-Dinitrotoluene	mg/kg	14	1.70	Yes	**Yes**
2,6-Dinitrotoluene	mg/kg	0.7	0.36	Yes	**Yes**
Acenaphthylene	mg/kg	0.03	350	No	No
Anthracene	mg/kg	0.018	1700	No	No
Benzo(a)anthracene	mg/kg	0.05	0.15	No	No
Benzo(a)pyrene	mg/kg	0.082	0.02	Yes	**Yes**
Benzo(b)fluoranthene	mg/kg	0.055	0.15	No	No
Benzo(ghi)perylene	mg/kg	0.066	NA (3)	Yes	**Yes**
Benzo(k)fluoranthene	mg/kg	0.058	1.50	No	No
Bis(2-Ethylhexyl)phthalate	mg/kg	0.74	38.0	No	No
Chrysene	mg/kg	0.13	15.0	No	No
Diethyl phthalate	mg/kg	0.035	4900	No	No
Di-n-butylphthalate	mg/kg	6.8	620	No	No
Fluoranthene	mg/kg	0.068	230	No	No
Hexachlorobenzene	mg/kg	0.11	0.33	No	No
Hexachloroethane	mg/kg	1.1	4.30	No	No
Indeno(1,2,3-cd)pyrene	mg/kg	0.052	0.15	No	No
Naphthalene	mg/kg	0.03	3.80	No	No
N-Nitrosodiphenylamine	mg/kg	0.32	110	No	No
N-Nitrosodipropylamine	mg/kg	1.6	0.08	Yes	**Yes**
Phenanthrene	mg/kg	0.046	NA (3)	Yes	**Yes**
Pyrene	mg/kg	0.11	170	No	No
Explosives					
1,3,5-Trinitrobenzene	mg/kg	0.19	220	No	No
2,4,6-Trinitrotoluene	mg/kg	0.6	3.60	No	No
2,4-Dinitrotoluene	mg/kg	1.1	1.70	No	No
2-amino-4,6-Dinitrotoluene	mg/kg	0.68	15.0	No	No
4-amino-2,6-Dinitrotoluene	mg/kg	0.5	15.0	No	No
HMX	mg/kg	0.47	380.0	No	No
Nitroglycerine	mg/kg	1.5	0.62	Yes	**Yes**
RDX	mg/kg	4.3	6.0	No	No
Tetryl	mg/kg	0.33	12.0	No	No
Pesticides/PCBs					
Aroclor-1254	mg/kg	2	0.11	Yes	**Yes**
4,4'-DDD	mg/kg	0.0024	2.20	No	No
4,4'-DDE	mg/kg	0.012	1.60	No	No
4,4'-DDT	mg/kg	0.0034	1.90	No	No
Aldrin	mg/kg	0.0022	0.03	No	No
Alpha-Chlordane	mg/kg	0.0057	1.80 (4)	No	No
Dieldrin	mg/kg	0.0074	0.03	No	No
Endosulfan I	mg/kg	0.032	37.0	No	No
Endosulfan II	mg/kg	0.00088	37.0 (5)	No	No
Endrin	mg/kg	0.0036	1.80	No	No
Endrin aldehyde	mg/kg	0.0032	1.80 (6)	No	No
Endrin ketone	mg/kg	0.00058	1.80 (6)	No	No
Gamma-Chlordane	mg/kg	0.0011	1.80 (4)	No	No
Methoxychlor	mg/kg	0.045	31.0	No	No
Inorganics					
Aluminum	mg/kg	35000	7700	Yes	**Yes**
Antimony	mg/kg	5.10	3.10	Yes	**Yes**
Arsenic	mg/kg	16.1	0.67	Yes	**Yes**
Barium	mg/kg	308	1500	No	No
Beryllium	mg/kg	1.40	16.0	No	No
Cadmium	mg/kg	1100	7.0	Yes	**Yes**
Calcium	mg/kg	193000	NA (7)	NA	No

Table 2.2
Human Health Risk Assessment Constituents of Potential Concern OD Hill Area
Combined Surface and Subsurface Soil (≤15 feet bgs)
Seneca Army Depot Activity

Analyte [1]	Units	Maximum Detected Concentration of Detected Analytes	Regional Screening Level (RSL) [2]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?
Chromium	mg/kg	446	0.30 [8]	Yes	**Yes**
Cobalt	mg/kg	19.7	2.3	Yes	**Yes**
Copper	mg/kg	7310	310	Yes	**Yes**
Cyanide	mg/kg	0.70	2.10	No	No
Iron	mg/kg	118000	NA [7]	NA	No
Lead	mg/kg	998	400	Yes	**Yes**
Magnesium	mg/kg	15000	NA [7]	NA	No
Manganese	mg/kg	1380	180	Yes	**Yes**
Mercury	mg/kg	9.10	2.3	Yes	**Yes**
Nickel	mg/kg	67.7	150	No	No
Potassium	mg/kg	4880	NA [7]	NA	No
Selenium	mg/kg	0.73	39.0	No	No
Silver	mg/kg	205	39.0	Yes	**Yes**
Sodium	mg/kg	377	NA [7]	NA	No
Thallium	mg/kg	0.27	0.078	Yes	**Yes**
Vanadium	mg/kg	53.7	39.0	Yes	**Yes**
Zinc	mg/kg	1470	2300	No	No

(1) Analytes shown are those that are detected in any sample, from surface soil (0 - ≤ 15 feet bgs) from the exposure area.

(2) USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

(3) No RSL available, so the analyte is considered a COPC.

(4) No RSL exists for alpha-chlordane or gamma-chlordane, therefore the RSL for chlordane was used as a surrogate.

(5) No RSL exists for endosulfan II, therefore the RSL for endosulfan used as a surrogate.

(6) No RSL exists for endrin aldehyde or endrin ketone, therefore the RSL for endrin used as a surrogate.

(7) Calcium, Iron, Magnesium, Potassium, and Sodium are essential nutrients and are not expected to pose an unacceptable risk to human receptors

(8) No RSL exists for total chromium, therefore the more conservative RSL for chromium(VI) used.

NA = Not applicaple because essential nutrient.

Table 2.3
Human Health Risk Assessment Constituents of Potential Concern Kickout Area
Surface Soil (≤2 feet bgs)
Seneca Army Depot Activity

Analyte [(1)]	Units	Maximum Detected Concentration	Regional Screening Level (RSL) [(2)]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?
Semivolatile Organic Compounds					
Benzo(b)fluoranthene	mg/kg	0.02	0.15	No	No
Bis(2-Ethylhexyl)phthalate	mg/kg	0.70	38.0	No	No
Chrysene	mg/kg	0.027	15.0	No	No
Fluoranthene	mg/kg	0.03	230	No	No
Hexachlorobenzene	mg/kg	0.03	0.33	No	No
Phenanthrene	mg/kg	0.018	NA [(3)]	Yes	**Yes**
Pyrene	mg/kg	0.036	170	No	No
Herbicides					
MCPA	mg/kg	9.40	3.10	Yes	**Yes**
Explosives					
1,3,5-Trinitrobenzene	mg/kg	0.10	220	No	No
2,4,6-Trinitrotoluene	mg/kg	1.40	3.60	No	No
2,4-Dinitrotoluene	mg/kg	0.84	1.70	No	No
2-amino-4,6-Dinitrotoluene	mg/kg	0.099	15.0	No	No
4-amino-2,6-Dinitrotoluene	mg/kg	0.27	15.0	No	No
RDX	mg/kg	5.80	6.0	No	No
Pesticides/PCBs					
4,4'-DDD	mg/kg	0.0033	2.20	No	No
Dieldrin	mg/kg	0.00079	0.03	No	No
Endosulfan I	mg/kg	0.055	37.0	No	No
Endrin	mg/kg	0.0036	1.80	No	No
Endrin aldehyde	mg/kg	0.0032	1.80 [(4)]	No	No
Endrin ketone	mg/kg	0.00058	1.80 [(4)]	No	No
Gamma-Chlordane	mg/kg	0.0011	1.80 [(5)]	No	No
Methoxychlor	mg/kg	0.045	31.0	No	No
Inorganics					
Aluminum	mg/kg	25000	7700	Yes	**Yes**
Antimony	mg/kg	2.40	3.10	No	No
Arsenic	mg/kg	7.60	0.67	Yes	**Yes**
Barium	mg/kg	365	1500	No	No
Beryllium	mg/kg	1.00	16.0	No	No
Cadmium	mg/kg	8.30	7.0	Yes	**Yes**
Calcium	mg/kg	41300	NA [(6)]	NA	No
Chromium	mg/kg	39.3	0.30 [(7)]	Yes	**Yes**
Cobalt	mg/kg	26.8	2.3	Yes	**Yes**
Copper	mg/kg	293	310	No	No
Iron	mg/kg	75700	NA [(6)]	NA	No
Lead	mg/kg	198	400	No	No
Magnesium	mg/kg	8440	NA [(6)]	NA	No
Manganese	mg/kg	5040	180	Yes	**Yes**
Mercury	mg/kg	1.90	2.3	No	No
Nickel	mg/kg	56.0	150	No	No
Potassium	mg/kg	4140	NA [(6)]	NA	No
Selenium	mg/kg	0.92	39.0	No	No
Silver	mg/kg	2.30	39.0	No	No
Sodium	mg/kg	138	NA [(6)]	NA	No
Vanadium	mg/kg	41.9	39.0	Yes	**Yes**
Zinc	mg/kg	383	2300	No	No

Table 2.3
Human Health Risk Assessment Constituents of Potential Concern Kickout Area
Surface Soil (≤2 feet bgs)
Seneca Army Depot Activity

Analyte [1]	Units	Maximum Detected Concentration	Regional Screening Level (RSL) [2]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?

[1] Analytes shown are those that are detected in any sample, from surface soil (0 - ≤ 2 feet bgs) from the exposure area.

[2] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

[3] No RSL available, so the analyte is considered a COPC.

[4] No RSL exists for endrin aldehyde or endrin ketone, therefore the RSL for endrin used as a surrogate.

[5] No RSL exists for gamma-chlordane, therefore the RSL for chlordane was used as a surrogate.

[5] No RSL exists for endosulfan II, therefore the RSL for endosulfan used as a surrogate.

[6] Calcium, Iron, Magnesium, Potassium, and Sodium are essential nutrients and are not expected to pose an unacceptable risk to human receptors

[7] No RSL exists for total chromium, therefore the more conservative RSL for chromium(VI) used.

Table 2.4
Human Health Risk Assessment Constituents of Potential Concern
Groundwater
Open Detonation Grounds - Seneca Army Depot Activity

Analyte [1]	Units	Maximum Detected Concentration	Regional Screening Level (RSL) [2]	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potential Concern (COPC)?
Volatile Organic Compounds					
Tetrachloroethene	µg/L	1.0	4.1	No	No
Semivolatile Organic Compounds					
Bis(2-Ethylhexyl)phthalate	µg/L	33	5.6	Yes	**Yes**
Explosives					
1,3-Dinitrobenzene	µg/L	0.067	0.20	No	No
HMX	µg/L	0.5	100	No	No
Inorganics					
Aluminum	µg/L	63300	2000	Yes	**Yes**
Antimony	µg/L	52.1	0.78	Yes	**Yes**
Arsenic	µg/L	9.5	0.052	Yes	**Yes**
Barium	µg/L	751	380	Yes	**Yes**
Beryllium	µg/L	5	2.5	Yes	**Yes**
Cadmium	µg/L	3.8	0.92	Yes	**Yes**
Calcium	µg/L	660000	NA [4]	No	No
Chromium	µg/L	106	0.035	Yes	**Yes**
Cobalt	µg/L	94.4	0.60	Yes	**Yes**
Copper	µg/L	123	80	Yes	**Yes**
Iron	µg/L	113000	NA [4]	No	No
Lead	µg/L	75.6	15 [3]	Yes	**Yes**
Magnesium	µg/L	77900	NA [4]	No	No
Manganese	µg/L	4640	43	Yes	**Yes**
Mercury	µg/L	1.8	0.57	Yes	**Yes**
Nickel	µg/L	209	39	Yes	**Yes**
Potassium	µg/L	18700	NA [4]	No	No
Selenium	µg/L	2.5	10	No	No
Silver	µg/L	4.6	9.4	No	No
Sodium	µg/L	40000	NA [4]	No	No
Thallium	µg/L	3.4	0.020	Yes	**Yes**
Vanadium	µg/L	93.1	8.6	Yes	**Yes**
Zinc	µg/L	321	600	No	No

Notes:
[1] Analytes shown are those that are detected in any sample, from any well within the exposure area.

[2] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

[3] No RSL available for Lead. The USEPA MCL action level was used in its place. (http://www.epa.gov/safewater/contaminants/index.html)

[4] Calcium, Iron, Magnesium, Potassium, and Sodium are essential nutrients and are not expected to pose an unacceptable risk to human receptors

[5] NA = Not applicable because screening value was not available.

Table 2.5
Human Health Risk Assessment Constituents of Potential Concern
Surface Water
Open Detonation Grounds - Seneca Army Depot Activity

Analyte [1]	Units	Maximum Detected Concentration	Regional Screening Level [2] (RSL)	Maximum Detected Concentration Exceeds RSL? (Yes/No)	Contaminant of Potentional Concern ? (COPC)
Volatile Organic Compounds					
1,2-Dichloroethane	µg/L	2	0.17	Yes	**Yes**
Acetone	µg/L	10	1400	No	No
Methyl chloride	µg/L	8	19	No	No
Semivolatile Organic Compounds					
Butylbenzylphthalate	µg/L	0.12	16	No	No
Diethyl phthalate	µg/L	0.072	1500	No	No
Explosives					
HMX	µg/L	0.49	100	No	No
RDX	µg/L	2	0.7	Yes	**Yes**
Inorganics					
Aluminum	µg/L	37500	2000	Yes	**Yes**
Arsenic	µg/L	2.3	0.052	Yes	**Yes**
Barium	µg/L	439	380	Yes	**Yes**
Beryllium	µg/L	1.5	2.5	No	No
Cadmium	µg/L	11.2	0.92	Yes	**Yes**
Calcium	µg/L	194000	NA [4]	No	No
Chromium	µg/L	50.8	0.035	Yes	**Yes**
Cobalt	µg/L	18.2	0.6	Yes	**Yes**
Copper	µg/L	612	80	Yes	**Yes**
Cyanide	µg/L	47.7	0.15	Yes	**Yes**
Iron	µg/L	60400	NA [4]	No	No
Lead	µg/L	68.7	15 [3]	Yes	**Yes**
Magnesium	µg/L	24300	NA [4]	No	No
Manganese	µg/L	1250	43	Yes	**Yes**
Mercury	µg/L	3	0.57	Yes	**Yes**
Nickel	µg/L	74.2	39	Yes	**Yes**
Potassium	µg/L	9670	NA [4]	No	No
Selenium	µg/L	1.6	10	No	No
Sodium	µg/L	59100	NA [4]	No	No
Vanadium	µg/L	54.9	8.6	Yes	**Yes**
Zinc	µg/L	883	600	Yes	**Yes**

Notes:
[1] Analytes shown are those that are detected in any sample, from any sample location within the exposure area.
[2] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.
[3] No RSL available for Lead. The USEPA MCL action level was used in its place.
[4] Calcium, Iron, Magnesium, Potassium, and Sodium are essential nutrients and are not expected to pose an unacceptable risk to human receptors
[5] NA = Not applicable because screening value was not available.

Table 2.6 Exposure Parameters for Soil Pathways: Ingestion, Dermal Absorption, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
IRS = Ingestion Rate, soil (mg/day)	Construction/ excavation worker	330	USEPA 1991 (pg. 15), recommended value for outdoor worker, same as adult resident; USEPA 2011a value not provided.	USEPA 2014a
	Park worker	100	USEPA 1991 (pg. 15), recommended value for outdoor worker, same as adult resident; USEPA 2011a value not provided.	USEPA 2014a
	Recreational adult (6 - 26 years)	100	Same as adult resident. USEPA 1991 (pp. 6 and 15); USEPA 2011a only provides a central tendency exposure (CTE) value.	USEPA 2014a
	Recreational child (0 - <6 years)	200	Same as child resident. USEPA 2011a (Table 5-1); "upper-bound values" accounting for both soil and dust ingestion.	USEPA 2014a
	Adult resident (6-26 years)	100	USEPA 1991 (pp. 6 and 15); USEPA 2011a only provides a CTE value.	USEPA 2014a
	Child resident (0-<6 years)	200	USEPA 2011a (Table 5-1); "upper-bound values" accounting for both soil and dust ingestion.	USEPA 2014a
EV = Event Frequency	All receptors	1	Assumes one event per day.	USEPA 2004
FC = Fraction Contacted	All receptors	1	Assumes entire exposure time spent at one exposure area.	
AF = Dermal Adherence Factor, soil (mg/cm^2)	Construction/ excavation worker	0.12	USEPA 2011a, Table 7-20 and Section 7.2.2; arithmetic mean of weighted average of body part-specific (hands, forearms, and face) mean adherence factors for adult commercial/industrial activities	USEPA 2014a

Table 2.6 Exposure Parameters for Soil Pathways: Ingestion, Dermal Absorption, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Park worker	0.12	USEPA 2011a, Table 7-20 and Section 7.2.2; arithmetic mean of weighted average of body part-specific (hands, forearms, and face) mean adherence factors for adult commercial/industrial activities	USEPA 2014a
	Recreational adult (6 - 26 years)	0.07	Same as adult resident. USEPA 2004 (Exhibit 3-5), RAGS Part E	USEPA 2014a
	Recreational child (0-<6 years)	0.2	Same as child resident. USEPA 2004 (Exhibit 3-5), RAGS Part E	USEPA 2014a
	Adult resident (6-26 years)	0.07	USEPA 2004 (Exhibit 3-5), RAGS Part E	USEPA 2014a
	Child resident (0-<6 years)	0.2	USEPA 2004 (Exhibit 3-5), RAGS Part E	USEPA 2014a
GIABS = Gastro Intestinal Absorption Factor (unitless) (also OAF = Oral Absorption Factor)	All receptors	Chemical-specific	Chemical-specific dermal absorption fraction obtained from USEPA RSL Tables.	USEPA 2014b, or most current version at time of draft report
ABS = Dermal Absorption Fraction (unitless)	All receptors	Chemical-specific	Chemical-specific dermal absorption fraction obtained from USEPA RSL Tables.	USEPA 2014b, or most current version at time of draft report
SA = Skin Surface Area (cm^2)	Construction/ excavation worker	3,470	USEPA 2011a, Table 7-2; weighted average of mean values for head, hands, and forearms (male and female, 21+years).	USEPA 2014a

Table 2.6 Exposure Parameters for Soil Pathways: Ingestion, Dermal Absorption, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Park worker	3,470	USEPA 2011a, Table 7-2; weighted average of mean values for head, hands, and forearms (male and female, 21+years).	USEPA 2014a
	Recreational adult (6-26 years)	6,032	Same as adult resident. USEPA 2011a, Tables 7-2 and 7-12; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, 21+ years) (forearm and lower leg-specific data used for males and female lower leg; ratio of male forearm to arm applied to female arm data).	USEPA 2014a
	Recreational child (0-<6 years)	2,690	Same as child resident. USEPA 2011a, Tables 7-2 and 7-8; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, birth to < 6 years) (forearm and lower leg-specific data used when available, ratios for nearest available age group used elsewhere (per USEPA 2011b))	USEPA 2014a
	Adult resident (6-26 years)	6,032	USEPA 2011a, Tables 7-2 and 7-12; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, 21+ years) (forearm and lower leg-specific data used for males and female lower leg; ratio of male forearm to arm applied to female arm data).	USEPA 2014a

Table 2.6 Exposure Parameters for Soil Pathways: Ingestion, Dermal Absorption, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Child resident (0-<6 years)	2,690	USEPA 2011a, Tables 7-2 and 7-8; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, birth to < 6 years) (forearm and lower leg-specific data used when available, ratios for nearest available age group used elsewhere (per USEPA 2011b))	USEPA 2014a
ET = Exposure Time, fraction of day breathing air at site (unitless)	Construction/ excavation worker	0.333	An 8 hour work day divided by 24 hours/day	USEPA 2014a
	Park worker	0.333	An 8 hour work day divided by 24 hours per day.	USEPA 2014a
	Recreational user (adult and child)	0.167	Professional judgment that receptor would be onsite 4 hours per day divided by 24 hours per day.	N/A
	Resident (adult and child)	1	The whole 24 hour day.	USEPA 2014a
EF = Exposure Frequency (days/year)	Construction/ excavation worker	30	Professional judgment. Assumes project of one month duration.	N/A
	Park worker	225	Outdoor worker. USEPA 1991 (pg. 15); value not provided in USEPA 2011a	USEPA 2014a
	Recreational user (adult and child)	24	Professional judgment. Assumes a recreational user may visit the site twice per month per year.	N/A
	Resident (adult and child)	350	USEPA 1991 (pg. 15); value not provided in USEPA 2011a	USEPA 2014a
ED = Exposure Duration (years)	Construction/ excavation worker	1	USEPA default value for construction workers.	USEPA 2002a

Table 2.6 Exposure Parameters for Soil Pathways: Ingestion, Dermal Absorption, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Park worker	25	USEPA 1991 (pg. 15); USEPA 2011a only provides a CTE value	USEPA 2014a
	Recreational adult (6-26 years)	20	Same as adult resident. Represents the number of years returning to the same location. Resident ED = 26 years (USEPA 2011a, Table 16-108; 90th percentile for current residence time) Resident ED (26 years) - EDc (6 years)	USEPA 2014a
	Recreational child (0-<6 years)	6	Same as child resident. Represents the number of years returning to the same location. USEPA 1991, Pages 6 and 15	USEPA 2014a
	Adult resident (6-26 years)	20	Resident ED = 26 years (USEPA 2011a, Table 16-108; 90th percentile for current residence time) Resident ED (26 years) - EDc (6 years)	USEPA 2014a
	Child resident (0-<6 years)	6	USEPA 1991, Pages 6 and 15	USEPA 2014a
CF_s= Conversion Factor, soil (kg/mg)	All receptors	1E-06		
BW = Body Weight (kg)	Construction/ excavation worker	80	Worker. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Park worker	80	Worker. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Recreational adult (6-26 years)	80	Same as adult resident. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a

Table 2.6 Exposure Parameters for Soil Pathways: Ingestion, Dermal Absorption, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Recreational child (0-<6 years)	15	Same as child resident. USEPA 2011a, Table 8-1; weighted average of mean body weights (birth to <6 years)	USEPA 2014a
	Adult resident (6-26 years)	80	Resident. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Child resident (0-<6 years)	15	USEPA 2011a, Table 8-1; weighted average of mean body weights (birth to <6 years)	USEPA 2014a
AT_{nc} = Averaging Time (days), noncarcinogens	Construction/ excavation worker	365	ED expressed in days (1 years x 365 days).	
	Park worker	9,125	ED expressed in days (25 years x 365 days).	
	Recreational adult (6-26 years)	7,040	ED expressed in days (20 years x 365 days).	
	Recreational child (0-<6 years)	2,190	ED expressed in days (6 years x 365 days).	
	Adult resident (6-26 years)	7,040	ED expressed in days (20 years x 365 days).	
	Child resident (0-<6 years)	2,190	ED expressed in days (6 years x 365 days).	
AT_c = Averaging Time (days), carcinogens	All receptors	25,550	70-year lifetime expressed in days (70 years x 365 days).	USEPA 2014a
VF = Volatilization Factor, soil (m^3/kg)	All receptors	Chemical-specific	The process and equations are described in USEPA 2011a; values obtained from USEPA RSL Calculator	USEPA, 2014b, or most current version at time of draft report
PEF= Particulate Emission Factor (m^3/kg)	All receptors	1.32E+09	USEPA default value PEF used for non-volatile compounds.	USEPA 1996

Table 2.7 Exposure Parameters for Groundwater Pathways: Ingestion, Dermal Contact, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
IRW = Groundwater Ingestion Rate (L/day)	Construction/ excavation worker	0.08	Based on ingestion rate of 10mL/hour, assuming an 8-hour work day.	USEPA 2000
	Park worker	2.5	Same as adult resident. USEPA 2011a, Table 3-33; 90th percentile of consumer-only ingestion of drinking water (≥ 21 years)	USEPA 2014a
	Recreational adult (6-26 years)	2.5	Same as adult resident. USEPA 2011a, Table 3-33; 90th percentile of consumer-only ingestion of drinking water (≥ 21 years)	USEPA 2014a
	Recreational child (0-<6 years)	0.78	Same as child resident. USEPA 2011a, Tables 3-15 and 3-33; weighted average of 90th percentile consumer-only ingestion of drinking water (birth to <6 years)	USEPA 2014a
	Adult resident (6-26 years)	2.5	USEPA 2011a, Table 3-33; 90th percentile of consumer-only ingestion of drinking water (≥ 21 years)	USEPA 2014a
	Child resident (0-<6 years)	0.78	USEPA 2011a, Tables 3-15 and 3-33; weighted average of 90th percentile consumer-only ingestion of drinking water (birth to <6 years)	USEPA 2014a
FI = Fraction Ingested (unitless)	All receptors	1	Professional judgment. Assumes entire exposure time spent at one exposure area.	N/A
K_p = Permeability Constant (cm/hour)	All receptors	Chemical-specific	Assume all drinking water comes from one well	N/A

Table 2.7 Exposure Parameters for Groundwater Pathways: Ingestion, Dermal Contact, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
SA = Skin Surface Area (cm^2)	Construction/ excavation worker	3,470	USEPA 2011a, Table 7-2; weighted average of mean values for head, hands, and forearms (male and female, 21+years).	USEPA 2014a
	Park worker	3,470	USEPA 2011a, Table 7-2; weighted average of mean values for head, hands, and forearms (male and female, 21+years).	USEPA 2014a
	Recreational adult (6-26 years)	2,230	USEPA 2011a, Table 7-2; average of mean values for head and hands (male and female, 21+ years).	USEPA 2011a
	Recreational child (0-<6 years)	970	USEPA 2011a, Table 7-2; weighted average of mean values for head and hands for children <6 years.	USEPA 2011a
	Adult resident (6-26 years)	20,900	USEPA 2011a, Table 7-10; weighted average of mean values for adults, male and female 21+.	USEPA 2014a
	Child resident (0-<6 years)	6,378	USEPA 2011a, Table 7-10; weighted average of mean values for children <6 years.	USEPA 2014a
EV = Event frequency (events/day)	Construction/ excavation worker	1	Professional judgment. Assumes a worker may come into contact with groundwater during excavation activities, for one event per day.	N/A
	Park worker	1	Professional judgment. Assumes a worker may come into contact with groundwater during work activities, for one event per day.	N/A
	Recreational user (adult and child)	1	Professional judgment. Assumes a recreational user may come into contact with groundwater, for one event per day.	N/A

Table 2.7 Exposure Parameters for Groundwater Pathways: Ingestion, Dermal Contact, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Resident (adult and child)	1	Professional judgment. Assumes a resident may come into contact with groundwater, for one event per day.	N/A
t_{event} = Event Duration (hours/event)	Construction/ excavation worker	2	Professional judgment. Assumes a worker may come into contact with groundwater during work activities, for one event per day, 2 hours per event.	N/A
	Park worker	1	Professional judgment. Assumes a worker may come into contact with groundwater during work activities, for one event per day, 1 hour per event.	N/A
	Recreational adult (6-26 years)	0.71	Same as adult resident, used as a conservative estimate. USEPA 2011a, Tables 16-30 and 16-31; weighted average of adult (21 to 78) 90th percentile of time spent bathing/ showering in a day, divided by mean number of baths/showers taken in a day.	USEPA 2014a
	Recreational child (0-<6 years)	0.54	Same as child resident, used as a conservative estimate. USEPA 2011a, Table 16-28; weighted average of 90th percentile time spent bathing (birth to <6 years)	USEPA 2014a
	Adult resident (6-26 years)	0.71	USEPA 2011a, Tables 16-30 and 16-31; weighted average of adult (21 to 78) 90th percentile of time spent bathing/ showering in a day, divided by mean number of baths/showers taken in a day.	USEPA 2014a
	Child resident (0-<6 years)	0.54	USEPA 2011a, Table 16-28; weighted average of 90th percentile time spent bathing (birth to <6 years)	USEPA 2014a

Table 2.7 Exposure Parameters for Groundwater Pathways: Ingestion, Dermal Contact, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
EF = Exposure Frequency (days/year)	Construction/ excavation worker	30	Professional judgment. Assumes project of one month duration.	N/A
	Park worker	225	Outdoor worker. USEPA 1991 (pg. 15); value not provided in USEPA 2011a	USEPA 2014a
	Recreational user (adult and child)	24	Professional judgment. Assumes a recreational user may visit the site twice per month per year.	N/A
	Resident (adult and child)	350	USEPA 1991 (pg. 15); value not provided in USEPA 2011a	USEPA 2014a
ED = Exposure Duration (years)	Construction/ excavation worker	1	USEPA default value for construction workers.	USEPA 2002
	Park worker	25	USEPA 1991 (pg. 15); USEPA 2011a only provides a CTE value	USEPA 2014a
	Recreational adult (6-26 years)	20	Same as adult resident. Represents the number of years returning to the same location. Resident ED = 26 years (USEPA 2011a, Table 16-108; 90th percentile for current residence time) Resident ED (26 years) - EDc (6 years)	USEPA 2014a
	Recreational child (0-<6 years)	6	Same as child resident. Represents the number of years returning to the same location. USEPA 1991, Pages 6 and 15	USEPA 2014a
	Adult resident (6-26 years)	20	Resident ED = 26 years (USEPA 2011a, Table 16-108; 90th percentile for current residence time) Resident ED (26 years) - EDc (6 years)	USEPA 2014a

Table 2.7 Exposure Parameters for Groundwater Pathways: Ingestion, Dermal Contact, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Child resident (0-<6 years)	6	USEPA 1991, Pages 6 and 15	USEPA 2014a
CF_w = Conversion Factor, water (µg/m)	All receptors	1,000		
BW = Body Weight (kg)	Construction/ excavation worker	80	Worker. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Park worker	80	Worker. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Recreational adult (6-26 years)	80	Same as adult resident. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Recreational child (0-<6 years)	15	Same as child resident. USEPA 2011a, Table 8-1; weighted average of mean body weights (birth to <6 years)	USEPA 2014a
	Adult resident (6-26 years)	80	Resident. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Child resident (0-<6 years)	15	USEPA 2011a, Table 8-1; weighted average of mean body weights (birth to <6 years)	USEPA 2014a
AT_{nc} = Averaging Time (days), noncarcinogens	Construction/ excavation worker	365	ED expressed in days (1 year x 365 days).	
	Park worker	9,125	ED expressed in days (25 years x 365 days).	
	Recreational adult (6-26 years)	7,040	ED expressed in days (20 years x 365 days).	
	Recreational child (0-<6 years)	2,190	ED expressed in days (6 years x 365 days).	

Table 2.7 Exposure Parameters for Groundwater Pathways: Ingestion, Dermal Contact, and Inhalation

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Adult resident (6-26 years)	7,040	ED expressed in days (20 years x 365 days).	
	Child resident (0-<6 years)	2,190	ED expressed in days (6 years x 365 days).	
AT_c = Averaging Time (days), carcinogens	All receptors	25,550	70-year lifetime expressed in days (70 years x 365 days).	USEPA 2014a
VF_w = Volatilization Factor, water (L/m^3)	All receptors	0.5		USEPA 2014c
FA = Fraction absorbed (unitless)	All receptors	Chemical-specific	Chemical specific values obtained from USEPA RSL Tables.	USEPA, 2014b, or most current version at time of draft report
B = Relative contribution of permeability coefficient (unitless)	All receptors	Chemical-specific	Chemical specific values obtained from USEPA RSL Tables.	USEPA, 2014b, or most current version at time of draft report
t^* = Time it takes to reach steady state (hours)	All receptors	Chemical-specific	Chemical specific values obtained from USEPA RSL Tables.	USEPA, 2014b, or most current version at time of draft report
τ_{event} = Lag Time per Event (hr/event)	All receptors	Chemical-specific	Chemical specific values obtained from USEPA RSL Tables.	USEPA, 2014b, or most current version at time of draft report

Table 2.8 Exposure Parameters for Surface Water Pathways: Incidental Ingestion and Dermal Contact

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
IRW = Surface Water Ingestion Rate (L/day)	All receptors	0.02	A 10-mL/hour ingestion rate will be estimated for the RME and is consistent with USEPA Region IV default values for wading activities, assuming a a 2-hour exposure.	USEPA 2000
FI = Fraction Ingested (unitless)	All receptors	1	Professional judgment. Assumes entire exposure time spent at one exposure area.	N/A
K_p = Permeability Constant (cm/hour)	All receptors	Chemical-specific	Chemical specific values obtained from USEPA RSL Tables.	USEPA, 2014b, or most current version at time of draft report
SA = Skin Surface Area (cm^2)	Construction/ excavation worker	3,470	USEPA 2011a, Table 7-2; weighted average of mean values for head, hands, and forearms (male and female, 21+years).	USEPA 2014a
	Park worker	3,470	USEPA 2011a, Table 7-2; weighted average of mean values for head, hands, and forearms (male and female, 21+years).	USEPA 2014a
	Recreational adult (6-26 years)	6,032	Same as adult resident. USEPA 2011a, Tables 7-2 and 7-12; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, 21+ years) (forearm and lower leg-specific data used for males and female lower leg; ratio of male forearm to arm applied to female arm data).	USEPA 2014a

Table 2.8 Exposure Parameters for Surface Water Pathways: Incidental Ingestion and Dermal Contact

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Recreational child (0-<6 years)	2,690	Same as child resident. USEPA 2011a, Tables 7-2 and 7-8; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, birth to < 6 years) (forearm and lower leg-specific data used when available, ratios for nearest available age group used elsewhere (per USEPA 2011b))	USEPA 2014a
	Adult resident (6-26 years)	6,032	USEPA 2011a, Tables 7-2 and 7-12; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, 21+ years) (forearm and lower leg-specific data used for males and female lower leg; ratio of male forearm to arm applied to female arm data).	USEPA 2014a
	Child resident (0-<6 years)	2,690	USEPA 2011a, Tables 7-2 and 7-8; weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, birth to < 6 years) (forearm and lower leg-specific data used when available, ratios for nearest available age group used elsewhere (per USEPA 2011b))	USEPA 2014a
EV = Event frequency (events/day)	Construction/ excavation worker	1	Professional judgment. Assumes a worker may come into contact with surface water during work activities, for one event per day.	N/A
	Park worker	1	Professional judgment. Assumes a worker may come into contact with surface water during work activities, for one event per day.	N/A

Table 2.8 Exposure Parameters for Surface Water Pathways: Incidental Ingestion and Dermal Contact

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Recreational user (adult and child)	1	Professional judgment. Assumes a /recreational user may come into contact with surface water, for one event per day.	N/A
	Resident (adult and child)	1	Professional judgment. Assumes a resident may come into contact with surface water, for one event per day.	N/A
t_{event} = Event Duration (hours/event)	Construction/ excavation worker	2	Professional judgment. Assumes a worker may come into contact with surface water during work activities, for one event per day, 2 hours per event.	N/A
	Park worker	2	Professional judgment. Assumes a worker may come into contact with surface water during work activities, for one event per day, 2 hours per event.	N/A
	Recreational user (adult and child)	2	Professional judgment. Assumes a resident may come into contact with surface water, for one event per day, 2 hours per event.	
	Resident (adult and child)	2	Professional judgment. Assumes a resident may come into contact with surface water, for one event per day, 2 hours per event.	N/A
ET = Exposure Time (hours/day)	Construction/ excavation worker	2	Professional judgment. Assumes a worker may come into contact with surface water during work activities, for one event per day, 2 hours per event.	N/A
	Park worker	2	Professional judgment. Assumes a worker may come into contact with surface water during work activities, for one event per day, 2 hours per event.	N/A

Table 2.8 Exposure Parameters for Surface Water Pathways: Incidental Ingestion and Dermal Contact

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Recreational user (adult and child)	2	Professional judgment. Assumes a visitor/recreational user may come into contact with surface water, for one event per day, 2 hours per event.	N/A
	Resident (adult and child)	2	Professional judgment. Assumes a resident may come into contact with surface water, for one event per day, 2 hours per event.	N/A
EF = Exposure Frequency (days/year)	Construction/ excavation worker	30	Professional judgment. Assumes project of one month duration.	N/A
	Park worker	113	Outdoor worker value of 225 days/year, and assumes that winter weather would preclude use of the creek for half of the year. USEPA 1991 (pg. 15); value not provided in USEPA 2011a.	USEPA 2014a
	Recreational user (adult and child)	24	Professional judgment. Assumes a recreational user may visit the site twice per month per year.	N/A
	Resident (adult and child)	175	USEPA 1991 (pg. 15) value of 350 days/year, and assumes that winter weather would preclude use of the creek for half of the year.; value not provided in USEPA 2011a.	USEPA 2014a
ED = Exposure Duration (years)	Construction/ excavation worker	1	USEPA default value for construction workers.	USEPA 2002
	Park worker	25	USEPA 1991 (pg. 15); USEPA 2011a only provides a CTE value	USEPA 2014a

Table 2.8 Exposure Parameters for Surface Water Pathways: Incidental Ingestion and Dermal Contact

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Recreational adult (6-26 years)	20	Same as adult resident. Represents the number of years returning to the same location. Resident ED = 26 years (USEPA 2011a, Table 16-108; 90th percentile for current residence time) Resident ED (26 years) - EDc (6 years)	USEPA 2014a
	Recreational child (0-<6 years)	6	Same as child resident. Represents the number of years returning to the same location. USEPA 1991, Pages 6 and 15	USEPA 2014a
	Adult resident (6-26 years)	20	Resident ED = 26 years (USEPA 2011a, Table 16-108; 90th percentile for current residence time) Resident ED (26 years) - EDc (6 years)	USEPA 2014a
	Child resident (0-<6 years)	6	USEPA 1991, Pages 6 and 15	USEPA 2014a
CF_w = Conversion Factor, water (L/ml or L/cm^2)	All receptors	1E-03		
BW = Body Weight (kg)	Construction/ excavation worker	80	Worker. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Park worker	80	Worker. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Recreational adult (6-26 years)	80	Same as adult resident. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Recreational child (0-<6 years)	15	Same as child resident. USEPA 2011a, Table 8-1; weighted average of mean body weights (birth to <6 years)	USEPA 2014a

Table 2.8 Exposure Parameters for Surface Water Pathways: Incidental Ingestion and Dermal Contact

Exposure Variable	Receptor	Reasonable Maximum Exposure (RME)	Rationale	Reference
	Adult resident (6-26 years)	80	Resident. USEPA 2011a, Table 8-3; weighted mean values for adults 21 – 78.	USEPA 2014a
	Child resident (0-<6 years)	15	USEPA 2011a, Table 8-1; weighted average of mean body weights (birth to <6 years)	USEPA 2014a
AT_{nc} = Averaging Time (days), noncarcinogens	Construction/ excavation worker	365	ED expressed in days (1 year x 365 days).	
	Park worker	9,125	ED expressed in days (25 years x 365 days).	
	Recreational adult (6-26 years)	7,040	ED expressed in days (20 years x 365 days).	
	Recreational child (0-<6 years)	2,190	ED expressed in days (6 years x 365 days).	
	Adult resident (6-26 years)	7,040	ED expressed in days (20 years x 365 days).	
	Child resident (0-<6 years)	2,190	ED expressed in days (6 years x 365 days).	
AT_c = Averaging Time (days), carcinogens	All receptors	25,550	70-year lifetime expressed in days (70 years x 365 days).	USEPA 2014a

Table 2.9
Surface Soil (0 - ≤ 2 ft bgs) Summary Statistics for UCL Calculation
Open Detonation (OD) Hill,
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Variable	Number Samples Detected	Total Number Samples (1)	Percent Detected	Minimum	Maximum	Mean	Standard Deviation	Shapiro Wilk Test Statistic (2)	Shapiro Wilk Critical Value	Distribution (3)	UCL test	UCL (4) (mg/kg)	Selected EPC (5) (mg/kg)	UCL or Max
Semivolatile Organic Compounds														
2,4-Dinitrotoluene	7	22	32%	0.083	2.5	0.642	0.854	0.681	0.803	Approx. Normal	95% KM (t)	**0.47**	**0.47**	UCL
Benzo(a)pyrene	4	22	18%	0.028	0.082	0.048	0.0237	N/A	N/A	N/A	N/A	N/A	**0.082**	Max
Benzo(ghi)perylene	2	22	9%	0.039	0.048	0.0435	0.00636	N/A	N/A	N/A	N/A	N/A	**0.048**	Max
N-Nitrosodipropylamine	1	22	5%	0.11	0.11	0.11	N/A	N/A	N/A	N/A	N/A	N/A	**0.11**	Max
Phenanthrene	5	22	23%	0.024	0.038	0.0292	0.00638	N/A	N/A	N/A	N/A	N/A	**0.038**	Max
Explosives														
Nitroglycerine	1	26	4%	1.5	1.5	1.5	N/A	N/A	N/A	N/A	N/A	N/A	**1.5**	Max
Pesticides/PCBs														
Aroclor-1254	4	22	18%	0.074	2	0.691	0.903	N/A	N/A	N/A	N/A	N/A	**2.0**	Max
Inorganics														
Aluminum	51	51	100%	5910	35000	18463	3902	0.844	5.49E-7 (6)	Nonparametric	95 %Student's-t	**19000**	**19000**	UCL
Arsenic	51	51	100%	4	16.1	5.994	2.308	0.641	5.88E-15 (6)	Nonparametric	95% Student's-t	**6.5**	**6.5**	UCL
Cadmium	48	51	94%	0.76	1100	30.43	157.7	0.163	0.947	Nonparametric	95% KM (Chebyshev)	**120**	**120**	UCL
Chromium	51	51	100%	10.6	446	37.04	58.64	0.204	0.0 (6)	Nonparametric	95% Student's-t	**51**	**51**	UCL
Cobalt	51	51	100%	9	19.7	12.12	1.613	0.865	5.11E-6 (6)	Gamma	95% Approx Gamma	**12**	**12**	UCL
Copper	51	51	100%	38.9	4180	491.5	599.7	0.508	0.0 (6)	Nonparametric	95% Chebyshev (Mean, SD)	**860**	**860**	UCL
Lead	51	51	100%	19.8	998	83.57	139.7	0.321	0.0 (6)	Nonparametric	95% Chebyshev (Mean, SD)	**170**	**170**	UCL
Manganese	51	51	100%	361	1080	610.9	134.9	0.864	4.66E-6 (6)	Nonparametric	95% Student's-t	**640**	**640**	UCL
Mercury	51	51	100%	0.15	7	3.2	1.734	0.964	0.223 (6)	Normal	95% Student's-t	**3.6**	**3.6**	UCL
Silver	41	51	80%	0.23	205	8.137	31.55	0.192	0.941	Nonparametric	95% KM (Chebyshev)	**24**	**24**	UCL
Thallium	4	51	8%	0.1	0.27	0.2	0.0726	N/A	N/A	N/A	N/A	N/A	**0.27**	Max
Vanadium	51	51	100%	16.6	53.7	29.64	5.129	0.832	1.62E-7 (6)	Nonparametric	95% Student's-t	**31**	**31**	UCL

(1) Total number of samples does not include field duplicates. If a field duplicate was collected, the best value between the duplicates was used to calculate the UCL.

(2) The null hypothesis is that the data are normally distributed. The test statistic is compared the Shapiro-Wilk Critical value, which is based on the number of samples. If Shaprio-Willk test statistic is greater than the critical value, do not reject the null hypothesis.
(3) The distribution of the data is estimated using the Shapiro-Wilk Test.
(4) The Upper Confidence Limit (UCL) is the 95% UCL using the distribution of the data. All data distributions and UCLs calculated in ProUCL (v. 5.0) (EPA 2013a).
(5) If enough samples were not available to calculate a 95% or greater UCL, the maximum detected concentration was selected as the EPC. If the maximum detected value is greater than the calculated UCL, the maximum detected value was used.
(6) 5% Shapiro Wilk P Value. For sample sizes >50, only approximate p-values are displayed in ProUCL.
N/A - Not available, because not enough detected samples in dataset.

Table 2.10
Combined Surface and Subsurface Soil (0 -≤ 15 ft bgs) Summary Statistics for UCL Calculation
Open Detonation (OD) Hill,
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Variable	Number Samples Detected	Total Number Samples [1]	Percent Detected	Minimum (mg/kg)	Maximum (mg/kg)	Mean	Standard Deviation	Shapiro Wilk Test Statistic [2]	Shapiro Wilk Critical Value	Distribution [3]	UCL test	UCL [4] (mg/kg)	Selected EPC [5] (mg/kg)	UCL or Max
Semivolatile Organic Compounds														
2,4-Dinitrotoluene	12	27	44%	0.059	14	1.588	3.967	0.43	0.86	Lognormal	97.5% KM Chebyshev	**4.1**	**4.1**	UCL
2,6-Dinitrotoluene	2	27	7%	0.041	0.7	0.371	0.466	N/A	N/A	N/A	N/A	N/A	**0.70**	Max
Benzo(a)pyrene	8	27	30%	0.028	0.082	0.0441	0.017	0.79	0.82	Gamma	95% Adjusted Gamma KM	**0.050**	**0.050**	UCL
Benzo(ghi)perylene	6	27	22%	0.034	0.066	0.0475	0.0113	0.97	0.79	Normal	95% KM (t)	**0.055**	**0.055**	UCL
N-Nitrosodipropylamine	5	27	19%	0.02	1.6	0.357	0.696	N/A	N/A	N/A	N/A	N/A	**1.6**	Max
Phenanthrene	9	27	33%	0.024	0.046	0.0342	0.0082	0.91	0.83	Normal	95% KM (t)	**0.039**	**0.039**	UCL
Explosives														
Nitroglycerine	1	26	4%	1.5	1.5	1.5	N/A	N/A	N/A	N/A	N/A	N/A	**1.5**	Max
Pesticides/PCBs														
Aroclor-1254	4	27	15%	0.074	2	0.691	0.903	N/A	N/A	N/A	N/A	N/A	**2.0**	Max
Inorganics														
Aluminum	71	71	100%	5910	35000	17810	3969	0.93	6.35E-4 [6]	Nonparametric	95% Student's-t	**19000**	**19000**	UCL
Antimony	27	71	38%	0.14	5.1	0.974	1.134	0.69	0.92	Lognormal	95% KM (t)	**0.72**	**0.72**	UCL
Arsenic	71	71	100%	3.3	16.1	5.876	2.107	0.71	0.0 [6]	Nonparametric	95% Student's-t	**6.3**	**6.3**	UCL
Cadmium	65	69	94%	0.04	1100	24.24	135.6	0.14	0.0 [6]	Nonparametric	95% KM (Chebyshev)	**92**	**92**	UCL
Chromium	71	71	100%	10.6	446	34.11	49.89	0.20	0.0 [6]	Nonparametric	95% Student's-t	**44**	**44**	UCL
Cobalt	71	71	100%	6.4	19.7	11.99	1.842	0.94	.00229 [6]	Gamma	95% Approx Gamma	**12**	**12**	UCL
Copper	71	71	100%	24.7	7310	598.5	997.4	0.45	0.0 [6]	Nonparametric	95% Chebyshev (Mean, Sd)	**1000**	**1000**	UCL
Lead	71	71	100%	11.2	998	76.78	119.7	0.33	0.0 [6]	Nonparametric	95% Chebyshev (Mean, Sd)	**140**	**140**	UCL
Manganese	71	71	100%	361	1380	604.5	164.2	0.84	1.74E-10 [6]	Nonparametric	95% Student's-t	**630**	**630**	UCL
Mercury	71	71	100%	0.02	9.1	3.548	2.096	0.954	.0276 [6]	Nonparametric	95% Chebyshev (Mean, Sd)	**4.6**	**4.6**	UCL
Silver	59	71	83%	0.12	205	7.703	27.16	0.24	0.0 [6]	Nonparametric	95% KM (Chebyshev)	**19**	**19**	UCL
Thallium	6	71	8%	0.1	0.27	0.2	0.0645	0.94	0.79	Normal	95% KM (t)	**0.11**	**0.11**	UCL
Vanadium	71	71	100%	16.6	53.7	28.67	5.431	0.92	6.25E-5 [6]	Nonparametric	95% Student's-t	**30**	**30**	UCL

[1] Total number of samples does not include field duplicates. If a field duplicate was collected, the best value between the duplicates was used to calculate the UCL.
[2] The null hypothesis is that the data are normally distributed. The test statistic is compared the Shapiro-Wilk Critical value, which is based on the number of samples. If Shaprio-Willk test statistic is greater than the critical value, do not reject the null hypothesis.
[3] The distribution of the data is estimated using the Shapiro-Wilk Test.
[4] The Upper Confidence Limit (UCL) is the 95% UCL using the distribution of the data. All data distributions and UCLs calculated in ProUCL (v. 4.1) (EPA 2010).
[5] If enough samples were not available to calculate a 95% or greater UCL, the maximum detected concentration was selected as the EPC. If the maximum detected value is greater than the calculated UCL, the maximum detected value was used.
N/A - Not available, because not enough detected samples in dataset.
[6] 5% Shapiro Wilk P Value. For sample sizes >50, only approximate p-values are displayed in ProUCL.

Table 2.11
Surface Soil (0 - ≤ 2 ft bgs) Summary Statistics for UCL Calculation
Kickout Area
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Variable	Number Samples Detected	Total Number Samples [(1)]	Percent Detected	Minimum	Maximum	Mean	Standard Deviation	Shapiro Wilk Test Statistic [(2)]	Shapiro Wilk Critical Value	Distribution [(3)]	UCL test	UCL [(4)] (mg/kg)	Selected EPC [(5)] (mg/kg)	UCL or Max
Semivolatile Organic Compounds														
Phenanthrene	1	7	14%	0.018	0.018	0.018	N/A	N/A	N/A	N/A	N/A	N/A	**0.018**	Max
Herbicides														
MCPA	2	7	29%	6.3	9.4	7.85	2.192	N/A	N/A	N/A	N/A	N/A	**9.4**	Max
Inorganics														
Aluminum	23	23	100%	14200	25000	18935	2232	0.965	0.914	Normal	95% Student's-t	**20000**	**20000**	UCL
Arsenic	23	23	100%	3.9	7.6	5.278	0.852	0.899	0.914	Gamma	95% Adjusted Gamma	**5.6**	**5.6**	UCL
Cadmium	11	23	48%	0.46	8.3	3.08	2.52	0.894	0.85	Normal	95% KM (t)	**2.6**	**2.6**	UCL
Chromium	23	23	100%	22.4	39.3	27.22	3.579	0.866	0.914	Approx. Normal	95% Student's-t	**29**	**29**	UCL
Cobalt	23	23	100%	7.7	26.8	12.47	4.623	0.894	0.850	Normal	95% KM (t)	**2.6**	**2.6**	UCL
Manganese	23	23	100%	256	5040	803.1	953.9	0.433	0.91	Approx. Lognormal	95% Chebyshev (Mean, Sd)	**1700**	**1700**	UCL
Mercury	23	23	100%	0.03	1.9	0.566	0.578	0.815	0.914	Gamma	95% Adjusted Gamma	**0.87**	**0.87**	UCL
Vanadium	23	23	100%	22.5	41.9	31.1	4.506	0.984	0.914	Normal	95% Student's-t	**33**	**33**	UCL

[(1)] Total number of samples does not include field duplicates. If a field duplicate was collected, the best value between the duplicates was used to calculate the UCL.
[(2)] The null hypothesis is that the data are normally distributed. The test statistic is compared the Shapiro-Wilk Critical value, which is based on the number of samples. If Shaprio-Willk test statistic is greater than the critical value, do not reject the null hypothesis.
[(3)] The distribution of the data is estimated using the Shapiro-Wilk Test.
[(4)] The Upper Confidence Limit (UCL) is the 95% UCL using the distribution of the data. All data distributions and UCLs calculated in ProUCL (v. 4.1) (EPA 2010).
[(5)] If enough samples were not available to calculate a 95% or greater UCL, the maximum detected concentration was selected as the EPC. If the maximum detected value is greater than the calculated UCL, the maximum detected value was used.
N/A - Not available, because not enough detected samples in dataset.

Table 2.12
Groundwater Exposure Point Concentrations by Well
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Analyte	Units	Exposure Point Concentration all wells combined (1)	Exposure Point Concentration for each well (2)													
			MW1	MW2	MW3	MW4	MW5	MW45-2	MW45-3	MW45-4	MW23-1	MW23-2	MW23-3	MW23-4	MW23-5	MW23-6
Semivolatile Organic Compounds																
Bis(2-Ethylhexyl)phthalate	µg/L	33	33	11 U	12	11	10 U	23	11 U	11 U	--	--	--	--	--	--
Inorganics																
Aluminum	µg/L	63,300	124 J	828	83.5 J	17,700	821	42 U	7,510	63300	--	--	--	--	--	--
Antimony	µg/L	52	24.3 J	23.1 J	52.1 J	49.6 J	28.1 J	26.8 J	36.7 J	21.6 UJ	--	--	--	--	--	--
Arsenic	µg/L	9.5 J	1.4 U	1.4 U	1.4 U	1.7 J	1.4 U	1.4 U	1.8 J	9.5 J	--	--	--	--	--	--
Barium	µg/L	751	56.5 J	50.8 J	25.5 J	195 J	82.8 J	27.2 J	62.1 J	751	--	--	--	--	--	--
Beryllium	µg/L	5	0.4 U	0.4 U	0.4 U	0.87 J	0.4 U	0.4 U	0.52 J	5	--	--	--	--	--	--
Cadmium	µg/L	3.8	2.2 J	2.1 U	2.1 U	3.8 J	2.1 U	2.9 J	3.2 J	4 U	--	--	--	--	--	--
Chromium	µg/L	106	2.6 U	4.1 J	2.6 U	28.9	2.6 J	2.6 U	16.1	106	--	--	--	--	--	--
Cobalt	µg/L	94.4	4.4 U	5.3 J	4.4 U	11 J	4.4 U	4.4 U	14.6 J	94.4	--	--	--	--	--	--
Copper	µg/L	123	3.1 U	7.2 J	3.9 J	79.2	3.1 U	3.1 U	11.9 J	123	25 U	25 U	25 U	20 U	25 U	25 U
Lead	µg/L	75.6	0.71 J	0.66 J	0.73 J	15.7	1.1 J	0.71 J	9.5	75.6	5 U	5 U	5 U	5.4	2.4 J	3.6 J
Manganese	µg/L	4,640	4.4 J	23.7	2.9 J	384	55	1,400	625	4640	--	--	--	--	--	--
Mercury	µg/L	1.8	0.04 U	0.04 U	0.04 U	1.8	0.04 U	0.04 U	0.08 J	0.29	--	--	--	--	--	--
Nickel	µg/L	209	4 U	4 U	4 U	43.9	4 U	10.2 J	30.7 J	209	--	--	--	--	--	--
Thallium	µg/L	3.4	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	3.4 J	--	--	--	--	--	--
Vanadium	µg/L	93.1	3.7 U	3.7 U	3.7 U	29.7 J	3.7 U	3.7 U	11.7 J	93.1	--	--	--	--	--	--

(1) Exposure point concentration is the maximum detected concentration from any well.
(2) Exposure point concentration for individual wells is the maximum detected concentration from that well.
U= Analyte not detected.
UJ = Analyte not detected, reported LOD may be inaccurate or imprecise
J = Analyte detected between MDL and practical quantitation limit (PQL).
-- = Analyte not sampled.

Table 2.13
Surface Water Exposure Point Concentrations
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Analyte	**Units**	**Exposure Point Concentration [1] for each surface water exposure area**					
		Reeder Creek Onsite and Downstream Samples		Drainage Ditch Samples		Reeder Creek Upstream of OD Grounds	
Volatile Organic Compounds							
1,2-Dichloroethane	µg/L	8	J	10	U	5	U
Methylene chloride	µg/L	2	J	10	U	5	U
Explosives							
RDX	µg/L	0.67		2		0.12	U
Inorganics							
Aluminum	µg/L	300		37500		140	
Cadmium	µg/L	11.2		11.2		0.88	
Chromium	µg/L	50.8		50.8		6.1	UJ
Cobalt	µg/L	18.2	J	18.2	J	1.7	U
Copper	µg/L	612.0		612		3	
Lead	µg/L	2.2		68.7		1.8	U
Manganese	µg/L	236.0		1250		69.4	
Mercury	µg/L	0.11		3		0.1	U
Vanadium	µg/L	30.9	U	54.9		39.2	J
Zinc	µg/L	15.4	J	883		14.3	

[1] Exposure point concentration is the maximum detected concentration of samples associated with that exposure area.

U= Analyte not detected.

J = Analyte detected between MDL and practical quantitation limit (PQL).

Table 2.14
Human Health Risk Assessment Toxicity Values
Soil
OD Grounds at Seneca Army Depot Activity, Romulus, New York

				Ingestion			Dermal Contact		Inhalation	
Analyte	**CAS #**	**Volatile Organic Compound (Yes/No)**	**ABS [1] (unitless)**	**RfD_o (mg/kg-day)**	**SF_o ((mg/kg-day)$^{-1}$)**	**OAF [2] (unitless)**	**RfD_d [3] (mg/kg-day)**	**SF_d [4] ((mg/kg-day)$^{-1}$)**	**RfC_i (mg/m^3)**	**IUR ((µg/m^3)$^{-1}$)**
Semivolatile Organic Compounds										
2,4-Dinitrotoluene	121-14-2	No	0.102	2.0E-03 I	3.1E-01 C	1	2.0E-03	3.1E-01		8.9E-05 C
2,6-Dinitrotoluene	606-20-2	No	0.099	3.0E-04 X	1.5E+00 P	1	3.0E-04	1.5E+00	--	--
Benzo(a)pyrene	50-32-8	No	0.13	--	7.3E+00 I	1	--	7.3E+00		1.1E-03 C
Benzo(ghi)perylene	191-24-2	No	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	No	0.1	--	7.0E+00 I	1	--	7.0E+01		2.0E-03 C
Phenanthrene	85-01-8	No	--	--	--	--	--	--	--	--
Herbicides										
MCPA		No	0.1	5.0E-04 I		1	5.0E-04	0.0E+00		
Explosives										
Nitroglycerine	55-63-0	No	0.1	1.0E-04 P	1.7E-02 P	1	1.0E-04	1.7E-02		
Pesticides/PCB										
Aroclor-1254	11097-69-1	No	0.14	2.0E-05 I	2.0E+00 S	1	2.0E-05	2.0E+00		5.7E-04 S
Inorganics										
Aluminum	7429-90-5	No	--	1.0E+00 P	--	1	1.0E+00	--	5.0E-03 P	--
Antimony	7440-36-0	No	--	4.0E-04 I	--	0.15	6.0E-05	--	--	--
Arsenic	7440-38-2	No	0.03	3.0E-04 I	1.5E+00 I	1	3.0E-04	1.5E+00	1.5E-05 C	4.3E-03 I
Cadmium (diet)	7440-43-9	No	0.001	1.0E-03 I	--	0.025	2.5E-05	--	1.0E-05 A	1.8E-03 I
Chromium (III)	16065-83-1	No	--	1.5E+00 I	--	0.013	2.0E-02	--	--	--
Chromium (VI)	18540-29-9	No	--	3.0E-03 I	5.0E-01 J	0.025	7.5E-05	2.0E+01	1.0E-04 I	8.4E-02 S
Cobalt	7440-48-4	No	--	3.0E-04 P	--	1	3.0E-04	--	6.0E-06 P	9.0E-03 P
Copper	7440-50-8	No	--	4.0E-02 H	--	1	4.0E-02	--	--	--
Manganese (diet)	7439-96-5	No	--	1.4E-01 I	--	1	1.4E-01	--	5.0E-05 I	--
Mercury	7487-94-7	No	--	3.0E-04 I	--	0.07	2.1E-05	--	3.0E-04 S	--
Silver	7440-22-4	No	--	5.0E-03 I	--	0.04	2.0E-04	--	--	--
Thallium	7440-28-0	No	--	1.0E-05 X	--	1	1.0E-05	--	--	--
Vanadium	7440-62-2	No	--	5.0E-03 S	--	0.026	1.3E-04	--	1.0E-04 A	--

(1) ABS is the recommended dermal absorption fraction of contaminants in soil. ABS values are obtained from Exhibit 3-4, Risk Assessment Guidance for Superfund, Volume I: Human
(2) OAF is the oral absorption factor of analytes that are absorbed in the intestinal tract. If the OAF is greater than 0.5, use 1.0 as a value, indicating that organic chemicals are generally
(3) RfD_d is the dermal reference dose and is based on the absorbed dose. The RFD_d is calculated as RfD_o*OAF.
(4) SF_d is the dermal slope factor and is based on absorbed dose. The SF_d is calculated as SF_o / OAF.
-- = toxicity data not available.

Sources:
A = ATSDR
C = Cal EPA
I = IRIS
J = New Jersey Department of Environmental Protection. See Section 5.6 of the RSL User Guide
P= PPRTV
S = RSL User Guide, Section 5.3
X= PPRTV Appendix

Table 2.15
Human Health Risk Assessment Toxicity Values
Groundwater

OD Grounds at Seneca Army Depot Activity, Romulus, New York

				Ingestion			Dermal Contact		Inhalation	
Analyte	**CAS #**	**Volatile Organic Compound (Yes/No)**	**ABS [(1)] (unitless)**	**RfD_o (mg/kg-day)**	**SF_o $((mg/kg\text{-}day)^{-1})$**	**OAF [(2)] (unitless)**	**RfD_d [(3)] (mg/kg-day)**	**SF_d [(4)] $((mg/kg\text{-}day)^{-1})$**	**RfC_i (mg/m^3)**	**IUR $((\mu g/m^3)^{-1})$**
Semivolatile Organic Compounds										
Bis(2-Etheylhexyl)phthalate	117-81-7	No	0.1	2.0E-02 I	1.4E-02 I	1	2.0E-02	1.4E-02	--	2.4E-06 C
Metals										
Aluminum	7429-90-5	No	--	1.0E+00 P	--	1	1.0E+00	--	5.0E-03 P	--
Antimony	7440-36-0	No	--	4.0E-04 I	--	0.15	6.0E-05	--	--	--
Arsenic	7440-38-2	No	0.03	3.0E-04 I	1.5E+00 I	1	3.0E-04	1.5E+00	1.5E-05 C	4.3E-03 I
Barium	7440-39-3	No	--	2.0E-01 I	--	0.07	1.4E-02	--	5.0E-04 H	--
Beryllium	7440-41-7	No	--	2.0E-03 I	--	0.007	1.4E-05	--	2.0E-05 I	2.4E-03 I
Cadmium (Water)	7440-43-9	No	0.001	5.0E-04 I	--	0.05	2.5E-05	--	1.0E-05 A	1.8E-03 I
Chromium (III)	16065-83-1	No	--	1.5E+00 I	--	0.013	2.0E-02	--	--	--
Chromium (VI)	18540-29-9	No	--	3.0E-03 I	5.0E-01 J	0.025	7.5E-05	2.0E+01	1.0E-04 I	8.4E-02 S
Cobalt	7440-48-4	No	--	3.0E-04 P	--	1	3.0E-04	--	6.0E-06 P	9.0E-03 P
Copper	7440-50-8	No	--	4.0E-02 H	--	1	4.0E-02	--	--	--
Manganese (non-diet)	7439-96-5	No	--	2.4E-02 S		0.04	9.6E-04		5.0E-05 I	
Mercury (Mercury Salts)	7487-94-7	No	--	3.0E-04 I	--	0.07	2.1E-05	--	3.0E-04 S	--
Nickel (Nickel Soluable Salts)	7440-02-0	No	--	2.0E-02 I	--	0.04	8.0E-04	--	9.0E-05 A	2.6E-04 C
Thallium	7440-28-0	No	--	1.0E-05 X	--	1	1.0E-05	--	--	--
Vanadium	7440-62-2	No	--	5.0E-03 S	--	0.026	1.3E-04	--	1.0E-04 A	--

[(1)] ABS is the recommended dermal absorption fraction of contaminants in soil. ABS values are obtained from Exhibit 3-4, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). USEPA 2004.

[(2)] OAF is the oral absorption factor of analytes that are absorbed in the intestinal tract. If the OAF is greater than 0.5, use 1.0 as a value, indicating that organic chemicals are generally well absorbed across the gastrointestinal tract. OAF values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

[(3)] RfD_d is the dermal reference dose and is based on the absorbed dose. The RFD_d is calculated as RfD_o*OAF.

[(4)] SF_d is the dermal slope factor and is based on absorbed dose. The SF_d is calculated as SF_o / OAF.

-- = toxicity data not available.

Sources:
A = ATSDR
C = Cal EPA
I = IRIS
J = New Jersey Department of Environmental Protection. See Section 5.6 of the RSL User Guide
P= PPRTV
S = RSL User Guide, Section 5.3
X= PPRTV Appendix

Table 2.16
Human Health Risk Assessment Toxicity Values
Surface Water

OD Grounds at Seneca Army Depot Activity, Romulus, New York

				Ingestion					Dermal Contact		Inhalation			
Analyte	**CAS #**	**Volatile Organic Compound (Yes/No)**	**ABS [1] (unitless)**	**RfD_o (mg/kg-day)**		**SF_o ((mg/kg-day)$^{-1}$)**		**OAF [2] (unitless)**	**RfD_d [3] (mg/kg-day)**	**SF_d [4] ((mg/kg-day)$^{-1}$)**	**RfC_i (mg/m^3)**		**IUR ((µg/m^3)$^{-1}$)**	
Volatile Organic Compounds														
1,2-Dichloroethane	107-06-2	Yes	--	6.0E-03	X	9.1E-02	I	1	6.0E-03	9.1E-02	7.0E-03	P	2.6E-05	I
Explosives														
RDX	121-82-4	No	0.015	3.0E-03	I	1.1E-01	I	1	3.0E-03	1.1E-01				
Inorganics														
Aluminum	7429-90-5	No	--	1.0E+00	P	--		1	1.0E+00	--	5.0E-03	P	--	
Antimony	7440-36-0	No	--	4.0E-04	I	--		0.15	6.0E-05	--	--		--	
Arsenic	7440-38-2	No	0.03	3.0E-04	I	1.5E+00	I	1	3.0E-04	1.5E+00	1.5E-05	C	4.3E-03	I
Barium	7440-39-3	No	--	2.0E-01	I	--		0.07	1.4E-02	--	5.0E-04	H	--	
Cadmium (Water)	7440-43-9	No	0.001	5.0E-04	I	--		0.05	2.5E-05	--	1.0E-05	A	1.8E-03	I
Chromium (III)	16065-83-1	No	--	1.5E+00	I	--		0.013	2.0E-02	--	--		--	
Chromium (VI)	18540-29-9	No	--	3.0E-03	I	5.0E-01	J	0.025	7.5E-05	2.0E+01	1.0E-04	I	8.4E-02	S
Cobalt	7440-48-4	No	--	3.0E-04	P	--		1	3.0E-04	--	6.0E-06	P	9.0E-03	P
Copper	7440-50-8	No	--	4.0E-02	H	--		1	4.0E-02	--	--		--	
Cyanide	57-12-5	Yes	--	6.0E-04	I	--		1	6.0E-04	--	8.0E-04	S		
Manganese (non-diet)	7439-96-5	No	--	2.4E-02	S	--		0.04	9.6E-04	--	5.0E-05	I		
Mercury (Mercury Salts)	7487-94-7	No	--	3.0E-04	I	--		0.07	2.1E-05	--	3.0E-04	S	--	
Nickel (Nickel Soluable Salts)	7440-02-0	No	--	2.0E-02	I	--		0.04	8.0E-04	--	9.0E-05	A	2.6E-04	C
Vanadium	7440-62-2	No	--	5.0E-03	S	--		0.026	1.3E-04	--	1.0E-04	A	--	
Zinc	7440-66-6	No		3.0E-01	I			1	3.0E-01	--	--		--	

[1] ABS is the recommended dermal absorption fraction of contaminants in soil. ABS values are obtained from Exhibit 3-4, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). USEPA 2004.

[2] OAF is the oral absorption factor of analytes that are absorbed in the intestinal tract. If the OAF is greater than 0.5, use 1.0 as a value, indicating that organic chemicals are generally well absorbed across the gastrointestinal tract. OAF values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (TR = 1E-06; THQ = 0.1), May 2014 . Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_01run_MAY2014.pdf.

[3] RfD_d is the dermal reference dose and is based on the absorbed dose. The RFD_d is calculated as RfD_o*OAF.

[4] SF_d is the dermal slope factor and is based on absorbed dose. The SF_d is calculated as SF_o / OAF.

-- = toxicity data not available.

Sources:
A = ATSDR
C = Cal EPA
I = IRIS
J = New Jersey Department of Environmental Protection. See Section 5.6 of the RSL User Guide
P= PPRTV
S = RSL User Guide, Section 5.3
X= PPRTV Appendix

Table 2.17
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Hypothetical Future Resident
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
2,4-Dinitrotoluene	0.47	2.1E-07	6.5E-08	3.2E-08	**3.1E-07**	0.0030	0.00028	0.00082	0.00012	--	**0.0038**	**0.00040**
Benzo(a)pyrene	0.082	8.6E-07	3.4E-07	1.0E-09	**1.2E-06**	--	--	--	--	--	**--**	**--**
Benzo(ghi)perylene	0.048	--	--	--	**--**	--	--	--	--	--	**--**	**--**
N-Nitrosodipropylamine	0.11	1.1E-06	3.4E-07	5.4E-07	**2.0E-06**	--	--	--	--	--	**--**	**--**
Phenanthrene	0.038	--	--	--	**--**	--	--	--	--	--	**--**	**--**
Explosives		--										
Nitroglycerine	1.5	3.7E-08	1.1E-08	--	**4.8E-08**	0.19	0.018	0.052	0.0076	--	**0.24**	**0.026**
Pesticides/PCB												
Aroclor-1254	2.0	5.8E-06	2.5E-06	4.4E-07	**8.7E-06**	1.3	0.12	0.48	0.071	--	**1.8**	**0.19**
Metals												
Aluminum	20000	--	--	--	**--**	0.26	0.024	--	--	0.0029	**0.26**	**0.027**
Arsenic	6.5	1.4E-05	1.3E-06	7.6E-09	**1.5E-05**	0.28	0.026	0.022	0.0033	0.00032	**0.30**	**0.030**
Cadmium	120	--	--	5.8E-08	**5.8E-08**	1.5	0.14	0.17	0.024	0.0087	**1.7**	**0.18**
Cobalt	12	--	--	2.9E-08	**2.9E-08**	0.51	0.048	--	--	0.0015	**0.51**	**0.049**
Copper	850	--	--	--	**--**	0.27	0.025	--	--	--	**0.27**	**0.025**
Manganese	640	--	--	--	**--**	0.058	0.0055	--	--	0.0093	**0.068**	**0.015**
Mercury	3.600	--	--	--	**--**	0.15	0.014	--	--	0.0000087	**0.15**	**0.014**
Silver	24	--	--	--	**--**	0.061	0.0058	--	--	--	**0.061**	**0.0058**
Thallium	0.27	--	--	--	**--**	0.35	0.032	--	--	--	**0.35**	**0.032**
Vanadium	31	--	--	--	**--**	0.079	0.0074	--	--	0.00023	**0.079**	**0.0077**
	Pathway Risk	**2.2E-05**	**4.5E-06**	**1.1E-06**		**5.0**	**0.47**	**0.72**	**0.11**	**0.023**		
				Total Risk	**2.8E-05**					**Hazard Index**	**5.8**	**0.60**
Chromium [2]												
Chromium (III)	51	--	--	--	**--**	0.00043	0.000041	--	--	--	**0.00043**	**0.000041**
Chromium (VI)	51	3.7E-05	--	1.2E-06	**3.8E-05**	0.22	0.020	--	--	0.0004	**0.22**	**0.021**
Pathway Risk (including Chromium (III))		**2.2E-05**	**4.5E-06**	**1.1E-06**	**2.8E-05**	**5.0**	**0.47**	**0.72**	**0.11**	**0.023**	**5.8**	**0.60**
				Total Risk (including Chromium(III))	**2.8E-05**					**Total Hazard (including Chromium(III))**	**5.8**	**0.60**
Pathway Risk (including Chromium (VI))		**5.9E-05**	**4.5E-06**	**2.3E-06**	**6.5E-05**	**5.2**	**0.49**	**0.72**	**0.11**	**0.023**	**6.0**	**0.62**
				Total Risk (including Chromium(VI))	**6.5E-05**					**Total Hazard (including Chromium(VI))**	**6.0**	**0.62**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.18
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Hypothetical Future Excavation/Construction Worker
Open Detonation Hill Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
2,4-Dinitrotoluene	0.47	7.0E-10	9.0E-11	3.5E-11	**8.3E-10**	0.000079	0.000010	--	**0.000090**
Benzo(a)pyrene	0.082	2.9E-09	4.8E-10	1.1E-12	**3.4E-09**	--	--	--	**--**
Benzo(ghi)perylene	0.048	--	--	--	**--**	--	--	--	**--**
N-Nitrosodipropylamine	0.11	3.7E-09	4.7E-10	6.0E-10	**4.8E-09**	--	--	--	**--**
Phenanthrene	0.038	--	--	--	**--**	--	--	--	**--**
Explosives									
Nitroglycerine	1.5	1.2E-10	1.6E-11	--	**1.4E-10**	0.0051	0.00064	--	**0.0057**
Pesticides/PCB									
Aroclor-1254	2.0	1.9E-08	3.4E-09	4.8E-10	**2.3E-08**	0.034	0.0060	--	**0.040**
Metals									
Aluminum	20000	--	--	--	**--**	0.0068	--	0.000083	**0.0069**
Arsenic	6.5	4.7E-08	1.8E-09	8.3E-12	**4.9E-08**	0.0073	0.00028	0.0000090	**0.0076**
Cadmium	120	--	--	6.4E-11	**6.4E-11**	0.041	0.0021	0.00025	**0.043**
Cobalt	12	--	--	3.2E-11	**3.2E-11**	0.014	--	0.000042	**0.014**
Copper	850	--	--	--	**--**	0.0072	--	--	**0.0072**
Manganese	640	--	--	--	**--**	0.0015	--	0.00027	**0.0018**
Mercury	3.600	--	--	--	**--**	0.0041	--	0.00000025	**0.0041**
Silver	24	--	--	--	**--**	0.0016	--	--	**0.0016**
Thallium	0.27	--	--	--	**--**	0.0092	--	--	**0.0092**
Vanadium	31	--	--	--	**--**	0.0021	--	0.0000064	**0.0021**
	Pathway Risk	**7.4E-08**	**6.3E-09**	**1.2E-09**		**0.13**	**0.0090**	**0.00066**	
				Total Risk	**8.2E-08**			**Hazard Index**	**0.14**
Chromium [2]									
Chromium (III)	51	--	--	--	**--**	0.000012	--	--	**0.000012**
Chromium (VI)	51	1.2E-07	--	1.3E-09	**1.2E-07**	0.0058	--	0.000011	**0.0058**
Pathway Risk (including Chromium (III))		**7.4E-08**	**6.3E-09**	**1.2E-09**	**8.2E-08**	**0.13**	**0.0090**	**0.001**	**0.14**
				Total Risk (including Chromium(III))	**8.2E-08**			**Total Hazard (including Chromium(III))**	**0.14**
Pathway Risk (including Chromium (VI))		**2.0E-07**	**6.3E-09**	**2.5E-09**	**2.1E-07**	**0.14**	**0.0090**	**0.001**	**0.15**
				Total Risk (including Chromium(VI))	**2.1E-07**			**Total Hazard (including Chromium(VI))**	**0.15**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.19
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Future Park Worker
Open Detonation Hill Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
2,4-Dinitrotoluene	0.47	4.0E-08	1.7E-08	6.6E-09	**6.4E-08**	0.00018	0.000077	--	**0.00026**
Benzo(a)pyrene	0.082	1.6E-07	8.9E-08	2.1E-10	**2.5E-07**	--	--	--	**--**
Benzo(ghi)perylene	0.048		--	--	**--**		--	--	**--**
N-Nitrosodipropylamine	0.11	2.1E-07	8.8E-08	1.1E-07	**4.1E-07**	--	--	--	**--**
Phenanthrene	0.038	--	--	--	**--**	--		--	**--**
Explosives									
Nitroglycerine	1.5	7.0E-09	2.9E-09	--	**9.9E-09**	0.012	0.0048	--	**0.016**
Pesticides/PCB									
Aroclor-1254	2.0	1.1E-06	6.4E-07	9.0E-08	**1.8E-06**	0.077	0.045	--	**0.12**
Metals									
Aluminum	20000	--		--	**--**	0.015		0.00062	**0.016**
Arsenic	6.5	2.7E-06	3.4E-07	1.6E-09	**3.0E-06**	0.017	0.0021	0.000068	**0.019**
Cadmium	120	--	--	1.2E-08	**1.2E-08**	0.092	0.015	0.0019	**0.11**
Cobalt	12	--	--	6.0E-09	**6.0E-09**	0.031	--	0.00031	**0.031**
Copper	850	--	--	--	**--**	0.016	--	--	**0.016**
Manganese	640	--	--	--	**--**	0.0035	--	0.0020	**0.0055**
Mercury	3.600	--	--	--	**--**	0.0092	--	0.0000019	**0.0092**
Silver	24	--	--	--	**--**	0.0037	--	--	**0.0037**
Thallium	0.27	--	--	--	**--**	0.021	--	--	**0.0208**
Vanadium	31	--	--	--	**--**	0.0048	--	0.000048	**0.0048**
	Pathway Risk	**4.2E-06**	**1.2E-06**	**2.3E-07**		**0.30**	**0.067**	**0.0049**	
				Total Risk	**5.6E-06**			**Hazard Index**	**0.37**
Chromium [2]									
Chromium (III)	51	--	--	--	**--**	0.000026	--	--	**0.000026**
Chromium (VI)	51	7.0E-06	--	2.4E-07	**7.3E-06**	0.013	--	0.000080	**0.013**
Pathway Risk (including Chromium (III))		**4.2E-06**	**1.2E-06**	**2.3E-07**	**5.6E-06**	**0.30**	**0.067**	**0.0049**	**0.37**
				Total Risk (including Chromium(III))	**5.6E-06**			**Total Hazard (including Chromium(III))**	**0.37**
Pathway Risk (including Chromium (VI))		**1.1E-05**	**1.2E-06**	**4.7E-07**	**1.3E-05**	**0.32**	**0.067**	**0.0050**	**0.39**
				Total Risk (including Chromium(VI))	**1.3E-05**			**Total Hazard (including Chromium(VI))**	**0.39**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.20
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Current and Future Recreational User
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Analyte	Exposure Point Concentration [(1)] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
2,4-Dinitrotoluene	0.47	1.4E-08	4.5E-09	3.8E-10	**1.9E-08**	0.00021	0.000019	0.000056	0.0000083	--	**0.00026**	**0.000028**
Benzo(a)pyrene	0.082	5.9E-08	2.3E-08	1.2E-11	**8.2E-08**	--	--	--	--	--	**--**	**--**
Benzo(ghi)perylene	0.048	--	--	--	**--**	--	--	--	--	--	**--**	**--**
N-Nitrosodipropylamine	0.11	7.6E-08	2.3E-08	6.3E-09	**1.1E-07**	--	--	--	--	--	**--**	**--**
Phenanthrene	0.038	--	--	--	**--**	--	--	--	--	--	**--**	**--**
Explosives												
Nitroglycerine	1.5	2.5E-09	7.7E-10	--	**3.3E-09**	0.013	0.0012	0.0035	0.00052	--	**0.017**	**0.0018**
Pesticides/PCB												
Aroclor-1254	2.0	3.9E-07	1.7E-07	5.1E-09	**5.7E-07**	0.088	0.0082	0.033	0.0049	--	**0.12**	**0.013**
Metals												
Aluminum	20000	--	--	--	**--**	0.018	0.0016	--	--	0.000034	**0.018**	**0.0016**
Arsenic	6.5	9.6E-07	8.8E-08	8.8E-11	**1.0E-06**	0.019	0.0018	0.0015	0.0002	0.0000037	**0.021**	**0.0020**
Cadmium	120	--	--	--	**--**	0.11	0.010	0.011	0.0017	0.00010	**0.12**	**0.012**
Cobalt	12	--	--	--	**--**	0.035	0.0030	--	--	0.000017	**0.035**	**0.0030**
Copper	850	--	--	--	**--**	0.019	0.0017	--	--	--	**0.019**	**0.0017**
Manganese	640	--	--	--	**--**	0.0040	0.00038	--	--	--	**0.0040**	**0.00038**
Mercury	3.600	--	--	--	**--**	0.011	0.0010	--	--	0.00000010	**0.011**	**0.0010**
Silver	24	--	--	--	**--**	0.0042	0.00039	--	--	--	**0.0042**	**0.00039**
Thallium	0.27	--	--	--	**--**	0.024	0.0020	--	--	--	**0.024**	**0.0020**
Vanadium	31	--	--	--	**--**	0.0054	0.00051	--	--	0.0000026	**0.0054**	**0.00051**
	Pathway Risk	**1.5E-06**	**3.1E-07**	**1.2E-08**		**0.34**	**0.032**	**0.049**	**0.0073**	**0.00016**		
				Total Risk	**1.8E-06**						**0.39**	**0.039**
Chromium [(2)]												
Chromium (III)	51	--	--	--	**--**	0.000030	0.0000028	--	--	--	**0.000030**	**0.0000028**
Chromium (VI)	51	2.5E-06	--	1.4E-08	**2.5E-06**	0.015	0.0014	--	--	0.0000043	**0.015**	**0.0014**
Pathway Risk (including Chromium (III))		**1.5E-06**	**3.1E-07**	**1.2E-08**	**1.8E-06**	**0.34**	**0.032**	**0.049**	**0.0073**	**0.00016**	**0.39**	**0.039**
				Total Risk (including Chromium(III))	**1.8E-06**					**Total Hazard (including Chromium(III))**	**0.39**	**0.039**
Pathway Risk (including Chromium (VI))		**4.0E-06**	**3.1E-07**	**2.5E-08**	**4.4E-06**	**0.36**	**0.033**	**0.049**	**0.0073**	**0.00016**	**0.41**	**0.041**
				Total Risk (including Chromium(VI))	**4.4E-06**					**Total Hazard (including Chromium(VI))**	**0.41**	**0.041**

[(1)] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
[(2)] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.21
Human Health Risk Evaluation Summary
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)
Hypothetical Future Resident
OD Grounds at Seneca Army Depot Activity, Romulus, New York

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
2,4-Dinitrotoluene	4.1	1.8E-06	5.6E-07	2.8E-07	**2.7E-06**	0.026	0.0024	0.0071	0.00105	--	**0.033**	**0.0035**
2,6-Dinitrotoluene	0.70	1.5E-06	4.6E-07	--	**2.0E-06**	0.030	0.0028	0.0079	0.00117	--	**0.038**	**0.0040**
Benzo(a)pyrene	0.050	5.3E-07	2.1E-07	6.3E-10	**7.3E-07**	--	--	--	--	--	**--**	**--**
Benzo(ghi)perylene	0.055	--	--	--	**--**	--	--	--	--	--	**--**	**--**
N-Nitrosodipropylamine	1.6	1.6E-05	4.9E-06	7.9E-06	**2.9E-05**	--	--	--	--	--	**--**	**--**
Phenanthrene	0.039	--	--	--	**--**	--	--	--	--	--	**--**	**--**
Explosives		--										
Nitroglycerine	1.5	3.7E-08	1.1E-08	--	**4.8E-08**	0.19	0.018	0.052	0.0076	--	**0.24**	**0.026**
Pesticides/PCB					**--**							
Aroclor-1254	2.0	5.8E-06	2.5E-06	4.4E-07	**8.7E-06**	1.3	0.12	0.48	0.071	--	**1.76**	**0.19**
Metals												
Aluminum	19000	--	--	--	**--**	0.24	0.023	--	--	0.003	**0.25**	**0.026**
Antimony	0.72		--	--	**--**	0.023	0.0022	--	--	--	**0.023**	**0.0022**
Arsenic	6.3	1.4E-05	1.2E-06	--	**1.5E-05**	0.27	0.025	0.022	0.003	--	**0.29**	**0.028**
Cadmium	92	--	--	4.5E-08	**4.5E-08**	1.2	0.11	0.13	0.019	0.007	**1.3**	**0.14**
Cobalt	12	--	--	2.9E-08	**2.9E-08**	0.5	0.05	--	--	0.001	**0.5**	**0.05**
Copper	1000	--	--	--	**--**	0.3196	0.02997	--	--	--	**0.3196**	**0.02997**
Manganese	630	--	--	--	**--**	0.058	0.0054	--	--	0.009	**0.067**	**0.015**
Mercury	4.6	--	--	--	**--**	0.20	0.018	--	--	0.00001	**0.20**	**0.018**
Silver	19	--	--	--	**--**	0.049	0.0046	--	--	--	**0.049**	**0.0046**
Thallium	0.11		--	--	**--**	0.14	0.013	--	--	--	**0.14**	**0.013**
Vanadium	30	--	--	--	**--**	0.077	0.0072	--	--	0.0002	**0.077**	**0.0074**
	Pathway Risk	**3.9E-05**	**9.9E-06**	**8.7E-06**		**4.6**	**0.43**	**0.70**	**0.10**	**0.020**		
				Total Risk	**5.8E-05**					**Total Hazard**	**5.3**	**0.55**
Chromium [2]												
Chromium (III)	44	--	--	--	**--**	0.00037	0.000035	--	--	--	**0.00037**	**0.000035**
Chromium (VI)	44	3.2E-05	--	1.0E-06	**3.3E-05**	0.19	0.018	--	--	0.0003	**0.19**	**0.018**
Pathway Risk (including Chromium (III))		**3.9E-05**	**9.9E-06**	**8.7E-06**	**5.8E-05**	**4.6**	**0.43**	**0.70**	**0.10**	**0.020**	**5.3039**	**0.55**
				Total Risk (including Chromium(III))	**5.8E-05**					**Total Hazard (including Chromium(III))**	**5.3**	**0.55**
Pathway Risk (including Chromium (VI))		**7.1E-05**	**9.9E-06**	**9.7E-06**	**3.3E-05**	**4.8**	**0.45**	**0.70**	**0.10**	**0.021**	**0.19**	**0.02**
				Total Risk (including Chromium(VI))	**9.1E-05**					**Total Hazard (including Chromium(VI))**	**5.5**	**0.57**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.22
Human Health Risk Evaluation Summary
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)
Hypothetical Future Excavation/Construction Worker
Open Detonation Hill Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Exposure Point Concentration [1] (mg/kg)	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
2,4-Dinitrotoluene	4.1	1.8E-09	7.9E-10	3.1E-10	**2.9E-09**	0.00021	0.000089	--	**0.00030**
2,6-Dinitrotoluene	0.70	1.5E-09	6.4E-10	--	**2.2E-09**	0.00024	0.000099	--	**0.00034**
Benzo(a)pyrene	0.050	5.4E-10	2.9E-10	6.9E-13	**8.3E-10**	--	--	--	**--**
Benzo(ghi)perylene	0.055	--	--	--	**--**	--	--	--	**--**
N-Nitrosodipropylamine	1.6	1.6E-08	6.8E-09	8.7E-09	**3.2E-08**	--	--	--	**--**
Phenanthrene	0.039	--	--	--	**--**	--	--	--	**--**
Explosives									
Nitroglycerine	1.5	3.7E-11	1.6E-11	--	**5.3E-11**	0.0015	0.00064	--	**0.0022**
Pesticides/PCB									
Aroclor-1254	2.0	5.9E-09	3.4E-09	4.8E-10	**9.8E-09**	0.010	0.0060	--	**0.016**
Metals									
Aluminum	19000	--	--	--	**--**	0.0020	--	0.000079	**0.0020**
Antimony	0.72	--	--	--	**--**	0.00018	--	--	**0.00018**
Arsenic	6.3	1.4E-08	1.7E-09	--	**1.6E-08**	0.0022	0.00027	--	**0.0024**
Cadmium	92	--	--	4.9E-11	**4.9E-11**	0.0094	0.0016	0.00019	**0.011**
Cobalt	12	--	--	--	**--**	0.004	--	0.00004	**0.004**
Copper	1000	--	--	--	**--**	0.002568	--	--	**0.002568**
Manganese	630	--	--	--	**--**	0.00046	--	0.00026	**0.00072**
Mercury	4.6	--	--	--	**--**	0.0016	--	0.00000032	**0.0016**
Silver	19	--	--	--	**--**	0.00039	--	--	**0.00039**
Thallium	0.11	--	--	--	**--**	0.0011	--	--	**0.0011**
Vanadium	30	--	--	--	**--**	0.00062	--	0.0000062	**0.00062**
	Pathway Risk	**4.0E-08**	**1.4E-08**	**9.5E-09**		**0.037**	**0.0087**	**0.00058**	
				Total Risk	**6.3E-08**			**Hazard Index**	**0.046**
Chromium [2]									
Chromium (III)	44	--	--	--	**--**	0.0000030	--	--	**0.0000030**
Chromium (VI)	44	3.2E-08	--	1.1E-09	**3.3E-08**	0.0015	--	0.0000091	**0.0015**
Pathway Risk (including Chromium (III))		**4.0E-08**	**1.4E-08**	**9.5E-09**	**6.3E-08**	**0.037**	**0.0087**	**0.00058**	**0.046**
				Total Risk (including Chromium(III))	**6.3E-08**			**Total Hazard (including Chromium(III))**	**0.046**
Pathway Risk (including Chromium (VI))		**7.2E-08**	**1.4E-08**	**1.1E-08**	**9.7E-08**	**0.038**	**0.0087**	**0.00059**	**0.0015**
				Total Risk (including Chromium(VI))	**9.7E-08**			**Total Hazard (including Chromium(VI))**	**0.048**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.23
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
All Wells
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	33	5.9E-06	--	NC	**5.9E-06**	0.082	0.049	--	--	NC	**0.082**	**0.049**
Metals												
Aluminum	63300	--	--	NC	**--**	3.2	1.9	0.017	0.011	NC	**3.2**	**1.9**
Antimony	52.1 J	--	--	NC	**--**	6.5	3.9	0.24	0.15	NC	**6.7**	**4.0**
Arsenic	9.5 J	1.8E-04	1.0E-06	NC	**1.8E-04**	1.6	0.95	0.0087	0.0053	NC	**1.6**	**0.95**
Barium	751	--	--	NC	**--**	0.19	0.11	0.015	0.0090	NC	**0.20**	**0.12**
Beryllium	5	--	--	NC	**--**	0.12	0.075	0.098	0.060	NC	**0.22**	**0.13**
Cadmium	3.8 J	--	--	NC	**--**	0.38	0.23	0.042	0.026	NC	**0.42**	**0.25**
Cobalt	94.4	--	--	NC	**--**	16	9.4	0.034	0.021	NC	**16**	**9.5**
Copper	123	--	--	NC	**--**	0.15	0.092	0.001	0.00052	NC	**0.15**	**0.093**
Manganese (non-diet)	4640	--	--	NC	**--**	9.6	5.8	1.3	0.81	NC	**11**	**6.6**
Mercury	1.8	--	--	NC	**--**	0.30	0.18	0.023	0.014	NC	**0.32**	**0.19**
Nickel	209	--	--	NC	**--**	0.52	0.313	0.014	0.0088	NC	**0.54**	**0.32**
Thallium	3.4 J	--	--	NC	**--**	17	10	0.093	0.057	NC	**17.0**	**10**
Vanadium	93.1	--	--	NC	**--**	0.93	0.56	0.20	0.12	NC	**1.1**	**0.68**
	Pathway Risk	**1.9E-04**	**1.0E-06**	**NC**	**1.9E-04**	**56**	**34**	**2.1**	**1.3**	**NC**	**58**	**35**
				Total Risk	**1.9E-04**					**Hazard Index**	**58**	**35**
Chromium [2]												
Chromium (III)	106	--	--	NC	**--**	0.0035	0.0021	0.0015	0.00091	NC	**0.0050**	**0.0030**
Chromium (VI)	106	6.8E-04	3.0E-04	NC	**9.8E-04**	1.8	1.1	0.77	0.47	NC	**2.5**	**1.5**
Pathway Risk (including Chromium (III))		**1.9E-04**	**1.0E-06**	NC	**1.9E-04**	**56**	**34**	**2.1**	**1.3**	NC	**58**	**35**
				Total Risk (including Chromium(III))	**1.9E-04**					**Total Hazard (including Chromium(III))**	**58**	**35**
Pathway Risk (including Chromium (VI))		**8.7E-04**	**3.0E-04**	NC	**1.2E-03**	**58**	**35**	**2.9**	**1.8**	NC	**61**	**37**
				Total Risk (including Chromium(VI))	**1.2E-03**					**Total Hazard (including Chromium(VI))**	**61**	**37**

[1] Exposure point concentration is the maximum detected concentration from all groundwater wells onsite. See Table 2.12.
[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.24
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
All Wells
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	33		5.4E-10	--	NC	**5.4E-10**	0.00014	--	NC	**0.00014**
Metals										
Aluminum	63300		--	--	NC	**--**	0.0052	0.00045	NC	**0.0057**
Antimony	52.1	J	--	--	NC	**--**	0.011	0.0062	NC	**0.017**
Arsenic	9.5	J	1.7E-08	1.5E-09	NC	**1.8E-08**	0.0026	0.00023	NC	**0.0028**
Barium	751		--	--	NC	**--**	0.00031	0.00038	NC	**0.00069**
Beryllium	5		--	--	NC	**--**	0.00021	0.0025	NC	**0.0028**
Cadmium	3.8	J	--	--	NC	**--**	0.00062	0.0011	NC	**0.0017**
Cobalt	94.4		--	--	NC	**--**	0.026	0.00090	NC	**0.027**
Copper	123		--	--	NC	**--**	0.00025	0.000022	NC	**0.00027**
Manganese (non-diet)	4640		--	--	NC	**--**	0.016	0.034	NC	**0.050**
Mercury	1.8		--	--	NC	**--**	0.00049	0.00061	NC	**0.0011**
Nickel	209		--	--	NC	**--**	0.00086	0.00037	NC	**0.0012**
Thallium	3.4	J	--	--	NC	**--**	0.028	0.0024	NC	**0.030**
Vanadium	93.1		--	--	NC	**--**	0.0015	0.0051	NC	**0.0066**
	Pathway Risk		**1.7E-08**	**1.5E-09**	**NC**		**0.093**	**0.055**	**NC**	
					Total Risk	**1.9E-08**			**Hazard Index**	**0.15**
Chromium [2]										
Chromium (III)	106		--	--	NC	**--**	0.0000058	0.000039	NC	**0.0000**
Chromium (VI)	106		6.2E-08	4.3E-07	NC	**4.9E-07**	0.0029	0.020	NC	**0.0**
Pathway Risk (including Chromium (III))			**1.7E-08**	**1.5E-09**	NC	**1.9E-08**	**0.093**	**0.05**	NC	**0**
					Total Risk (including Chromium(III))	**1.9E-08**			**Total Hazard (including Chromium(III))**	**0.15**
Pathway Risk (including Chromium (VI))			**8.0E-08**	**4.3E-07**	NC	**4.9E-07**	**0.10**	**0.075**	NC	**0.023**
					Total Risk (including Chromium(VI))	**5.1E-07**			**Total Hazard (including Chromium(VI))**	**0.17**

[1] Exposure point concentration is the maximum detected concentration from all groundwater wells onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.25
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
All Wells
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [(1)] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
Bis(2-Ethylhexyl)phthalate	33	3.2E-06	--	NC	**3.2E-06**	0.032	--	NC	**0.032**
Metals									
Aluminum	63300	--	--	NC	**--**	1.2	0.0017	NC	**1.2**
Antimony	52.1 J	--	--	NC	**--**	2.5	0.023	NC	**2.5**
Arsenic	9.5 J	9.8E-05	1.4E-07	NC	**9.8E-05**	0.61	0.00085	NC	**0.61**
Barium	751	--	--	NC	**--**	0.072	0.0014	NC	**0.07**
Beryllium	5	--	--	NC	**--**	0.048	0.0095	NC	**0.06**
Cadmium	3.8 J	--	--	NC	**--**	0.15	0.0041	NC	**0.15**
Cobalt	94.4	--	--	NC	**--**	6.1	0.0034	NC	**6.1**
Copper	123	--	--	NC	**--**	0.059	0.000082	NC	**0.059**
Manganese (non-diet)	4640	--	--	NC	**--**	3.7	0.13	NC	**3.9**
Mercury	1.8	--	--	NC	**--**	0.12	0.0023	NC	**0.12**
Nickel	209	--	--	NC	**--**	0.20	0.0014	NC	**0.20**
Thallium	3.4 J	--	--	NC	**--**	6.5	0.0091	NC	**7**
Vanadium	93.1	--	--	NC	**--**	0.36	0.019	NC	**0.38**
	Pathway Risk	**1.0E-04**	**1.4E-07**	**NC**		**21.71**	**0.205**	**NC**	
				Total Risk	**1.0E-04**			**Hazard Index**	**22**
Chromium [(2)]									
Chromium (III)	106	--	--	NC	**--**	0.0014	0.00015	NC	**0.0015**
Chromium (VI)	106	3.6E-04	4.0E-05	NC	**4.1E-04**	0.68	0.076	NC	**0.8**
Pathway Risk (including Chromium (III))		**1.0E-04**	**1.4E-07**	NC	**1.0E-04**	**21.71**	**0.21**	NC	**22**
				Total Risk (including Chromium(III))	**1.0E-04**			**Total Hazard (including Chromium(III))**	**21.91**
Pathway Risk (including Chromium (VI))		**4.7E-04**	**1.4E-07**	NC	**4.7E-04**	**22.39**	**0.28**	NC	**23**
				Total Risk (including Chromium(VI))	**5.1E-04**			**Total Hazard (including Chromium(VI))**	**22.67**

[(1)] Exposure point concentration is the maximum detected concentration from all groundwater wells onsite. See Table 2.12.

[(2)] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.26
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
All Wells
Seneca Army Depot Activity

Analyte	Exposure Point Concentration (1) (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	33	4.1E-07	--	NC	**4.1E-07**	0.0056	0.0034	--	--	NC	**0.0056**	**0.0034**
Metals												
Aluminum	63300	--	--	NC	**--**	0.22	0.13	0.00018	0.000078	NC	**0.22**	**0.13**
Antimony	52.1 J	--	--	NC	**--**	0.45	0.27	0.0025	0.0011	NC	**0.45**	**0.27**
Arsenic	9.5 J	1.3E-05	8.5E-09	NC	**1.3E-05**	0.11	0.065	0.000090	0.000039	NC	**0.11**	**0.065**
Barium	751	--	--	NC	**--**	0.013	0.0077	0.00015	0.000066	NC	**0.013**	**0.0078**
Beryllium	5	--	--	NC	**--**	0.0085	0.0051	0.0010	0.00044	NC	**0.010**	**0.0055**
Cadmium	3.8 J	--	--	NC	**--**	0.026	0.016	0.00043	0.00019	NC	**0.026**	**0.016**
Cobalt	94.4	--	--	NC	**--**	1.1	0.65	0.00036	0.00015	NC	**1.1**	**0.65**
Copper	123	--	--	NC	**--**	0.011	0.0063	0.0000088	0.0000038	NC	**0.011**	**0.0063**
Manganese (non-diet)	4640	--	--	NC	**--**	0.66	0.40	0.014	0.0059	NC	**0.67**	**0.41**
Mercury	1.8	--	--	NC	**--**	0.021	0.012	0.00024	0.00011	NC	**0.021**	**0.012**
Nickel	209	--	--	NC	**--**	0.036	0.021	0.00015	0.000064	NC	**0.036**	**0.021**
Thallium	3.4 J	--	--	NC	**--**	1.2	0.70	0.0010	0.00042	NC	**1.2**	**0.70**
Vanadium	93.1	--	--	NC	**--**	0.064	0.038	0.0020	0.00088	NC	**0.066**	**0.039**
	Pathway Risk	**1.3E-05**	**8.5E-09**	**NC**		**3.9**	**2.3**	**0.022**	**0.0094**	**NC**		
				Total Risk	**1.3E-05**					**Hazard Index**	**3.9**	**2.3**
Chromium (2)												
Chromium (III)	106	--	--	NC	**--**	0.00024	0.00015	0.000016	0.0000067	NC	**0.00026**	**0.00016**
Chromium (VI)	106	4.7E-05	2.5E-06	NC	**5.0E-05**	0.12	0.073	0.0081	0.0035	NC	**0.13**	**0.077**
Pathway Risk (including Chromium (III))		**1.3E-05**	**8.5E-09**	NC		**3.9**	**2.3**	**0.022**	**0.0094**	NC		
				Total Risk (including Chromium(III))	**1.3E-05**					**Total Hazard (including Chromium(III))**	**3.9**	**2.3**
Pathway Risk (including Chromium (VI))		**6.0E-05**	**8.5E-09**	NC	**6.0E-05**	**4.0**	**2.4**	**0.030**	**0.013**	NC		
				Total Risk (including Chromium(VI))	**6.3E-05**					**Total Hazard (including Chromium(VI))**	**4.1**	**2.4**

(1) Exposure point concentration is the maximum detected concentration from all groundwater wells onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.27
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 1
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (μg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	33	5.9E-06	--	NC	**5.9E-06**	0.082	0.049	--	--	NC	**0.082**	**0.049**
Metals												
Aluminum	124 J	--	--	NC	**--**	0.0062	0.0037	0.000034	0.000021	NC	**0.0062**	**0.0037**
Antimony	24.3 J	--	--	NC	**--**	3.0	1.8	0.11	0.068	NC	**3.1**	**1.9**
Arsenic	1.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	56.5 J	--	--	NC	**--**	0.014	0.0085	0.0011	0.00068	NC	**0.015**	**0.0091**
Beryllium	0.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.2 J	--	--	NC	**--**	0.22	0.13	0.024	0.015	NC	**0.24**	**0.15**
Cobalt	4.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3.1 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Manganese (non-diet)	4.4 J	--	--	NC	**--**	0.0091	0.0055	0.0013	0.00077	NC	**0.010**	**0.0063**
Mercury	0.04 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Thallium	1.2 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
		5.9E-06	**--**	**NC**	**5.9E-06**	**3.4**	**2.0**	**0.14**	**0.084**	**NC**	**3.5**	**2.1**
				Total Risk	**5.9E-06**					**Hazard Index**	**3.5**	**2.1**
Chromium [2]												
Chromium (III)	2.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	2.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))		**5.9E-06**	**0.0E+00**	NC	**5.9E-06**	**3.4**	**2.0**	**0.14**	**0.084**	NC	**3.5**	**2.1**
				Total Risk (including Chromium(III))	**5.9E-06**					**Total Hazard (including Chromium(III))**	**3.5**	**2.1**
Pathway Risk (including Chromium (VI))		**5.9E-06**	**0.0E+00**	NC	**5.9E-06**	**3.4**	**2.0**	**0.14**	**0.084**	NC	**3.5**	**2.1**
				Total Risk (including Chromium(VI))	**5.9E-06**					**Total Hazard (including Chromium(VI))**	**3.5**	**2.1**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.28
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 1
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	33		5.4E-10	--	NC	**5.4E-10**	0.00014	--	NC	**0.00014**
Metals										
Aluminum	124	J	--	--	NC	**--**	0.000010	0.00000088	NC	**0.000011**
Antimony	24.3	J	--	--	NC	**--**	0.0050	0.0029	NC	**0.0079**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	56.5	J	--	--	NC	**--**	0.000023	0.000029	NC	**0.000052**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.2	J	--	--	NC	**--**	0.00036	0.00063	NC	**0.0010**
Cobalt	4.4	U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	NC	**--**
Manganese (non-diet)	4.4	J	--	--	NC	**--**	0.000015	0.000033	NC	**0.000048**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4	U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			5.4E-10	**--**	**NC**		**0.0055**	**0.0036**	**NC**	
					Total Risk	**5.4E-10**			**Hazard Index**	**0.0091**
Chromium [2]										
Chromium (III)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))			**5.4E-10**	**0.0E+00**	NC	**5.4E-10**	**0.0055**	**0.0036**	NC	**0.0091**
					Total Risk (including Chromium(III))	**5.4E-10**			**Total Hazard (including Chromium(III))**	**0.0091**
Pathway Risk (including Chromium (VI))			**5.4E-10**	**0.0E+00**	NC	**5.4E-10**	**0.0055**	**0.0036**	NC	**0.0091**
					Total Risk (including Chromium(VI))	**5.4E-10**			**Total Hazard (including Chromium(VI))**	**0.0091**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.29
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 1
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	33		3.2E-06	--	NC	**3.2E-06**	0.032	--	NC	**0.032**
Metals										
Aluminum	124	J	--	--	NC	**--**	0.0024	0.0000033	NC	**0.0024**
Antimony	24.3	J	--	--	NC	**--**	1.2	0.011	NC	**1.2**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	56.5	J	--	--	NC	**--**	0.0054	0.00011	NC	**0.0055**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.2	J	--	--	NC	**--**	0.085	0.0024	NC	**0.087**
Cobalt	4.4	U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	NC	**--**
Manganese (non-diet)	4.4	J	--	--	NC	**--**	0.0035	0.00012	NC	**0.0037**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4	U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			3.2E-06	**--**	**NC**		**1.3**	**0.013**	**NC**	
					Total Risk	**3.2E-06**			**Hazard Index**	**1.3**
Chromium [2]										
Chromium (III)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))			**3.2E-06**	**0.0E+00**	NC	**3.2E-06**	**1.3**	**0.013**	NC	**1.3**
					Total Risk (including Chromium(III))	**3.2E-06**			**Total Hazard (including Chromium(III))**	**1.3**
Pathway Risk (including Chromium (VI))			**3.2E-06**	**0.0E+00**	NC	**3.2E-06**	**1.3**	**0.013**	NC	**1.3**
					Total Risk (including Chromium(VI))	**3.2E-06**			**Total Hazard (including Chromium(VI))**	**1.3**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.30
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 1
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds													
Bis(2-Ethylhexyl)phthalate	33		4.1E-07	--	NC	**4.1E-07**	0.0056	0.0034	--	--	NC	**0.0056**	**0.0034**
Metals													
Aluminum	124	J	--	--	NC	**--**	0.00042	0.00025	0.00000035	0.00000015	NC	**0.00042**	**0.00025**
Antimony	24.3	J	--	--	NC	**--**	0.21	0.12	0.0012	0.00050	NC	**0.21**	**0.13**
Arsenic	1.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	56.5	J	--	--	NC	**--**	0.0010	0.00058	0.000012	0.0000050	NC	**0.001**	**0.0006**
Beryllium	0.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.2	J	--	--	NC	**--**	0.015	0.0090	0.00025	0.00011	NC	**0.015**	**0.009**
Cobalt	4.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Manganese (non-diet)	4.4	J	--	--	NC	**--**	0.00063	0.00038	0.000013	0.0000056	NC	**0.00064**	**0.00038**
Mercury	0.04	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
			4.1E-07	**--**	**NC**		**0.23**	**0.14**	**0.0014**	**0.00062**	**NC**		
					Total Risk	**4.1E-07**					**Hazard Index**	**0.23**	**0.14**
Chromium [2]													
Chromium (III)	2.6	U	--		NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	2.6	U	--		NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))			**4.1E-07**	**0.0E+00**	NC	**4.1E-07**	**0.23**	**0.14**	**0.0014**	**0.00062**	NC	**0.23**	**0.14**
					Total Risk (including Chromium(III))	**4.1E-07**					**Total Hazard (including Chromium(III))**	**0.23**	**0.14**
Pathway Risk (including Chromium (VI))			**4.1E-07**	**0.0E+00**	NC	**4.1E-07**	**0.23**	**0.14**	**0.0014**	**0.00062**	NC		
					Total Risk (including Chromium(VI))	**4.1E-07**					**Total Hazard (including Chromium(VI))**	**0.23**	**0.14**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.31
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [(1)] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	11 U	--	--	NC	--	--	--	--	--	NC	--	--
Metals												
Aluminum	828	--	--	NC	--	0.041	0.025	0.00023	0.000	NC	0.042	0.025
Antimony	23.1 J	--	--	NC	--	2.9	1.7	0.11	0.07	NC	3.0	1.8
Arsenic	1.4 U	--	--	NC	--	--	--	--	--	NC	--	--
Barium	50.8 J	--	--	NC	--	0.013	0.0076	0.0010	0.0006	NC	0.014	0.0082
Beryllium	0.4 U	--	--	NC	--	--	--	--	--	NC	--	--
Cadmium	2.1 U	--	--	NC	--	--	--	--	--	NC	--	--
Cobalt	5.3 J	--	--	NC	--	0.88	0.53	0.0019	0.001	NC	0.88	0.53
Copper	7.2 J	--	--	NC	--	0.0090	0.0054	0.000049	0.00003	NC	0.0090	0.0054
Manganese (non-diet)	23.7	--	--	NC	--	0.049	0.030	0.0068	0.00	NC	0.056	0.034
Mercury	0.04 U	--	--	NC	--	--	--	--	--	NC	--	--
Nickel	4 U	--	--	NC	--	--	--	--	--	NC	--	--
Thallium	1.2 U	--	--	NC	--	--	--	--	--	NC	--	--
Vanadium	3.7 U	--	--	NC	--	--	--	--	--	NC	--	--
		--	**--**	**NC**	**--**	**3.9**	**2.3**	**0.12**	**0.071**	**NC**	**4.0**	**2.4**
				Total Risk	**0.0E+00**					**Hazard Index**	**4.0**	**2.4**
Chromium [(2)]												
Chromium (III)	4.1 J	--	--	NC	--	0.00014	0.000082	0.000058	0.000035	NC	0.0002	0.0001
Chromium (VI)	4.1 J	2.6E-05	1.2E-05	NC	3.8E-05	0.068	0.041	0.030	0.018	NC	0.10	0.059
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	--	**3.9**	**2.3**	**0.12**	**0.071**	NC	**4.0**	**2.4**
				Total Risk (including Chromium(III))	**0.0E+00**					**Total Hazard (including Chromium(III))**	**4.0**	**2.4**
Pathway Risk (including Chromium (VI))		**2.6E-05**	**0.0E+00**	NC	**2.6E-05**	**3.9**	**2.4**	**0.15**	**0.089**	NC	**4.1**	**2.5**
				Total Risk (including Chromium(VI))	**3.8E-05**					**Total Hazard (including Chromium(VI))**	**4.1**	**2.5**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.32
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	--	--	--	NC	--
Metals										
Aluminum	828		--	--	NC	--	0.0001	0.00001	NC	**0.000074**
Antimony	23.1	J	--	--	NC	--	0.005	0.0027	NC	**0.0074**
Arsenic	1.4	U	--	--	NC	--	--	--	NC	--
Barium	50.8	J	--	--	NC	--	0.00002	0.00003	NC	**0.000047**
Beryllium	0.4	U	--	--	NC	--	--	--	NC	--
Cadmium	2.1	U	--	--	NC	--	--	--	NC	--
Cobalt	5.3	J	--	--	NC	--	0.002	0.00005	NC	**0.0016**
Copper	7.2	J	--	--	NC	--	0.00002	0.000001	NC	**0.000016**
Manganese (non-diet)	23.7		--	--	NC	--	0.000	0.000	NC	**0.00026**
Mercury	0.04	U	--	--	NC	--	--	--	NC	--
Nickel	4	U	--	--	NC	--	--	--	NC	--
Thallium	1.2	U	--	--	NC	--	--	--	NC	--
Vanadium	3.7	U	--	--	NC	--	--	--	NC	--
			--	**--**	**NC**		**0.006**	**0.003**	**NC**	
					Total Risk	**0.0E+00**			**Hazard Index**	**0.009**
Chromium [2]										
Chromium (III)	4.1	J	--	--	NC	--	0.0000002	0.000002	NC	**0.0000017**
Chromium (VI)	4.1	J	2.4E-09	1.7E-08	NC	**1.9E-08**	0.0001	0.001	NC	**0.00089**
Pathway Risk (including Chromium (III))			**0.0E+00**	**0.0E+00**	NC	--	**0.0064**	**0.0030**	NC	**0.0093**
					Total Risk (including Chromium(III))	**0.0E+00**			**Total Hazard (including Chromium(III))**	**0.0093**
Pathway Risk (including Chromium (VI))			**2.4E-09**	**1.7E-08**	NC	**1.9E-08**	**0.0065**	**0.0037**	NC	**0.00089**
					Total Risk (including Chromium(VI))	**1.9E-08**			**Total Hazard (including Chromium(VI))**	**0.010**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.33
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	**--**	--	--	NC	**--**
Metals										
Aluminum	828		--	--	NC	**--**	0.0	0.0000	NC	**0.016**
Antimony	23.1	J	--	--	NC	**--**	1.1	0.010	NC	**1.1**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	50.8	J	--	--	NC	**--**	0.005	0.0001	NC	**0.0050**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.1	U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	5.3	J	--	--	NC	**--**	0.3	0.0002	NC	**0.34**
Copper	7.2	J	--	--	NC	**--**	0.004	0.000005	NC	**0.0035**
Manganese (non-diet)	23.7		--	--	NC	**--**	0.0	0.00	NC	**0.020**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4	U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			--	**--**	**NC**		**1.5**	**0.011**	**NC**	
					Total Risk	**0.0E+00**			**Hazard Index**	**1.5**
Chromium [2]										
Chromium (III)	4.1	J	--	--	NC	**--**	0.0001	0.00001	NC	**0.0001**
Chromium (VI)	4.1	J	1.4E-05	1.6E-06	NC	**1.6E-05**	0.03	0.003	NC	**0.029**
Pathway Risk (including Chromium (III))			**0.0E+00**	**0.0E+00**	NC	**--**	**1.5**	**0.011**	NC	**1.5**
					Total Risk (including Chromium(III))	**0.0E+00**			**Total Hazard (including Chromium(III))**	**1.49**
Pathway Risk (including Chromium (VI))			**1.4E-05**	**0.0E+00**	NC	**1.4E-05**	**1.5**	**0.014**	NC	**1.5**
					Total Risk (including Chromium(VI))	**1.6E-05**			**Total Hazard (including Chromium(VI))**	**1.5**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.34
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds													
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Metals													
Aluminum	828		--	--	NC	**--**	0.0028	0.0017	0.00000	0.000001	NC	**0.0028**	**0.0017**
Antimony	23.1	J	--	--	NC	**--**	0.20	0.12	0.0011	0.0005	NC	**0.20**	**0.12**
Arsenic	1.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	50.8	J	--	--	NC	**--**	0.001	0.0005	0.00001	0.000005	NC	**0.001**	**0.0005**
Beryllium	0.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.1	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cobalt	5.3	J	--	--	NC	**--**	0.1	0.04	0.00002	0.00001	NC	**0.1**	**0.04**
Copper	7.2	J	--	--	NC	**--**	0.001	0.0004	0.0000005	0.0000002	NC	**0.001**	**0.0004**
Manganese (non-diet)	23.7		--	--	NC	**--**	0.0034	0.0020	0.000070	0.000030	NC	**0.0035**	**0.0020**
Mercury	0.04	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
			--	**--**	**NC**		**0.27**	**0.16**	**0.001**	**0.0005**	**NC**		
					Total Risk	**0.0E+00**					**Hazard Index**	**0.27**	**0.16**
Chromium [2]													
Chromium (III)	4.1	J	--	--	NC	**--**	0.0000093	0.0000060	0.000001	0.0000003	NC	**0.00001**	**0.00001**
Chromium (VI)	4.1	J	1.8E-06	9.8E-08	NC	**1.9E-06**	0.0047	0.0028	0.0003	0.0001	NC	**0.01**	**0.003**
Pathway Risk (including Chromium (III))			**0.0E+00**	**0.0E+00**	NC	**--**	**0.27**	**0.16**	**0.001**	**0.0005**	NC	**0.27**	**0.161**
					Total Risk (including Chromium(III))	**0.0E+00**					**Total Hazard (including Chromium(III))**	**0.27**	**0.16**
Pathway Risk (including Chromium (VI))			**1.8E-06**	**0.0E+00**	NC	**1.8E-06**	**0.27**	**0.16**	**0.002**	**0.001**	NC		
					Total Risk (including Chromium(VI))	**1.9E-06**					**Total Hazard (including Chromium(VI))**	**0.27**	**0.16**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.35
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	12	2.2E-06	--	NC	**2.2E-06**	0.030	0.018	--	--	NC	**0.030**	**0.018**
Metals												
Aluminum	83.5 J	--	--	NC	**--**	0.0042	0.0025	0.000023	0.000014	NC	**0.004**	**0.003**
Antimony	52.1 J	--	--	NC	**--**	6.5	3.9	0.24	0.15	NC	**6.7**	**4.0**
Arsenic	1.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	25.5 J	--	--	NC	**--**	0.0064	0.0038	0.00050	0.00031	NC	**0.007**	**0.0041**
Beryllium	0.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.1 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cobalt	4.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3.9 J	--	--	NC	**--**	0.0049	0.0029	0.000027	0.000016	NC	**0.0049**	**0.0029**
Manganese (non-diet)	2.9 J	--	--	NC	**--**	0.0060	0.0036	0.00083	0.00051	NC	**0.007**	**0.004**
Mercury	0.04 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Thallium	1.2 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
		2.2E-06	**--**	**NC**	**2.2E-06**	**6.5**	**3.9**	**0.24**	**0.147**	**NC**	**6.8**	**4.1**
				Total Risk	**2.2E-06**					**Hazard Index**	**6.8**	**4.1**
Chromium [2]												
Chromium (III)	2.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	2.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))		**2.2E-06**	**0.0E+00**	NC	**2.2E-06**	**6.5**	**3.9**	**0.24**	**0.147**	NC	**6.8**	**4.1**
				Total Risk (including Chromium(III))	**2.2E-06**					**Total Hazard (including Chromium(III))**	**6.8**	**4.1**
Pathway Risk (including Chromium (VI))		**2.2E-06**	**0.0E+00**	NC	**2.2E-06**	**6.5**	**3.9**	**0.24**	**0.147**	NC	**6.8**	**4.1**
				Total Risk (including Chromium(VI))	**2.2E-06**					**Total Hazard (including Chromium(VI))**	**6.8**	**4.1**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.36
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	12		2.0E-10	--	NC	**2.0E-10**	0.000049	--	NC	**0.000049**
Metals										
Aluminum	83.5	J	--	--	NC	**--**	0.0000069	0.00000060	NC	**0.0000075**
Antimony	52.1	J	--	--	NC	**--**	0.011	0.0062	NC	**0.017**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	25.5	J	--	--	NC	**--**	0.000010	0.000013	NC	**0.000023**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.1	U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	4.4	U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.9	J	--	--	NC	**--**	0.0000080	0.00000070	NC	**0.0000087**
Manganese (non-diet)	2.9	J	--	--	NC	**--**	0.000010	0.000022	NC	**0.000031**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4	U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			2.0E-10	**--**	**NC**		**0.011**	**0.006**	**NC**	
					Total Risk	**2.0E-10**			**Hazard Index**	**0.017**
Chromium [2]										
Chromium (III)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))			**2.0E-10**	**0.0E+00**	NC	**2.0E-10**	**0.0108**	**0.0062**	NC	**0.017**
					Total Risk (including Chromium(III))	**2.0E-10**			**Total Hazard (including Chromium(III))**	**0.017**
Pathway Risk (including Chromium (VI))			**2.0E-10**	**0.0E+00**	NC	**0.0E+00**	**0.0108**	**0.0062**	NC	**0.0000**
					Total Risk (including Chromium(VI))	**2.0E-10**			**Total Hazard (including Chromium(VI))**	**0.017**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.37
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
Bis(2-Ethylhexyl)phthalate	12	1.2E-06	--	NC	**1.2E-06**	0.012	--	NC	**0.012**
Metals									
Aluminum	83.5 J	--	--	NC	**--**	0.0016	0.0000022	NC	**0.0016**
Antimony	52.1 J	--	--	NC	**--**	2.5	0.023	NC	**2.5**
Arsenic	1.4 U	--	--	NC	**--**	--	--	NC	**--**
Barium	25.5 J	--	--	NC	**--**	0.0025	0.000049	NC	**0.0025**
Beryllium	0.4 U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.1 U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	4.4 U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.9 J	--	--	NC	**--**	0.0019	0.0000026	NC	**0.0019**
Manganese (non-diet)	2.9 J	--	--	NC	**--**	0.0023	0.000081	NC	**0.0024**
Mercury	0.04 U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4 U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2 U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7 U	--	--	NC	**--**	--	--	NC	**--**
		1.2E-06	**--**	**NC**		**2.5**	**0.023**	**NC**	
				Total Risk	**1.2E-06**			**Hazard Index**	**2.6**
Chromium [2]									
Chromium (III)	2.6 U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	2.6 U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))		**1.2E-06**	**0.0E+00**	NC	**1.2E-06**	**2.5**	**0.023**	NC	**2.6**
				Total Risk (including Chromium(III))	**1.2E-06**			**Total Hazard (including Chromium(III))**	**2.6**
Pathway Risk (including Chromium (VI))		**1.2E-06**	**0.0E+00**	NC	**1.2E-06**	**2.5**	**0.023**	NC	**2.6**
				Total Risk (including Chromium(VI))	**1.2E-06**			**Total Hazard (including Chromium(VI))**	**2.6**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.38
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds													
Bis(2-Ethylhexyl)phthalate	11	U	1.5E-07	--	NC	**1.5E-07**	0.0021	0.0012	--	--	NC	**0.0021**	**0.0012**
Metals													
Aluminum	828		--	--	NC	**--**	0.00029	0.00017	0.00000024	0.00000010	NC	**0.0003**	**0.0002**
Antimony	23.1	J	--	--	NC	**--**	0.45	0.27	0.0025	0.0011	NC	**0.45**	**0.27**
Arsenic	1.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	50.8	J	--	--	NC	**--**	0.00044	0.00026	0.0000052	0.0000022	NC	**0.000**	**0.0003**
Beryllium	0.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.1	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cobalt	5.3	J	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	7.2	J	--	--	NC	**--**	0.00033	0.00020	0.00000028	0.00000012	NC	**0.00033**	**0.00020**
Manganese (non-diet)	23.7		--	--	NC	**--**	0.00041	0.00025	0.0000086	0.0000037	NC	**0.00042**	**0.00025**
Mercury	0.04	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
			1.5E-07	**--**	**NC**		**0.45**	**0.27**	**0.002**	**0.0011**	**NC**		
					Total Risk	**1.5E-07**					**Hazard Index**	**0.45**	**0.27**
Chromium [2]													
Chromium (III)	4.1	J	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	4.1	J	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))			**1.5E-07**	**0.0E+00**	NC	**1.5E-07**	**0.45**	**0.27**	**0.002**	**0.0011**	NC	**0.45**	**0.271**
					Total Risk (including Chromium(III))	**1.5E-07**					**Total Hazard (including Chromium(III))**	**0.45**	**0.27**
Pathway Risk (including Chromium (VI))			**1.5E-07**	**0.0E+00**	NC	**1.5E-07**	**0.45**	**0.27**	**0.002**	**0.001**	NC		
					Total Risk (including Chromium(VI))	**1.5E-07**					**Total Hazard (including Chromium(VI))**	**0.45**	**0.27**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.39
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	11	2.0E-06	--	NC	**2.0E-06**	0.027	0.016	--	--	NC	**0.027**	**0.016**
Metals												
Aluminum	17700	--	--	NC	**--**	0.88	0.53	0.004800	0.003000	NC	**0.89**	**0.53**
Antimony	49.6 J	--	--	NC	**--**	6.2	3.7	0.23	0.14	NC	**6.4**	**3.9**
Arsenic	1.7 J	3.3E-05	1.8E-07	NC	**3.3E-05**	0.28	0.17	0.002	0.001	NC	**0.3**	**0.17**
Barium	195 J	--	--	NC	**--**	0.049	0.029	0.00380	0.00230	NC	**0.052**	**0.032**
Beryllium	0.87 J	--	--	NC	**--**	0.022	0.013	0.0170	0.010	NC	**0.04**	**0.02**
Cadmium	3.8 J	--	--	NC	**--**	0.38	0.23	0.042	0.026	NC	**0.42**	**0.25**
Cobalt	11 J	--	--	NC	**--**	1.8	1.1	0.004	0.003	NC	**1.8**	**1.1**
Copper	79.2	--	--	NC	**--**	0.10	0.059	0.000540	0.000330	NC	**0.099**	**0.060**
Manganese (non-diet)	384	--	--	NC	**--**	0.80	0.48	0.11000	0.06700	NC	**0.91**	**0.55**
Mercury	1.8	--	--	NC	**--**	0.30	0.18	0.023	0.014	NC	**0.32**	**0.19**
Nickel	43.9	--	--	NC	**--**	0.11	0.066	0.003	0.002	NC	**0.11**	**0.07**
Thallium	1.2 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	29.7 J	--	--	NC	**--**	0.30	0.18	0.062	0.038	NC	**0.4**	**0.22**
		3.5E-05	**1.8E-07**	**NC**	**3.5E-05**	**11.3**	**6.8**	**0.50**	**0.306**	**NC**	**11.8**	**7.1**
				Total Risk	**3.5E-05**					**Hazard Index**	**11.8**	**7.1**
Chromium [2]												
Chromium (III)	28.9	--	--	NC	**--**	0.0010	0.00058	0.00	0.00	NC	**0.0014**	**0.0008**
Chromium (VI)	28.9	1.9E-04	8.3E-05	NC	**2.7E-04**	0.48	0.29	0.21	0.13	NC	**0.69**	**0.419**
Pathway Risk (including Chromium (III))		**3.5E-05**	**1.8E-07**	NC	**3.5E-05**	**11**	**6.8**	**0.50**	**0.31**	NC	**12**	**7.1**
				Total Risk (including Chromium(III))	**3.5E-05**					**Total Hazard (including Chromium(III))**	**12**	**7.1**
Pathway Risk (including Chromium (VI))		**2.2E-04**	**1.8E-07**	NC	**2.2E-04**	**12**	**7.1**	**0.71**	**0.44**	NC	**12**	**7.5**
				Total Risk (including Chromium(VI))	**3.0E-04**					**Total Hazard (including Chromium(VI))**	**12**	**7.5**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.40
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11		1.8E-10	--	NC	**1.8E-10**	0.000045	--	NC	**0.000045**
Metals										
Aluminum	17700		--	--	NC	**--**	0.0015000	0.00013000	NC	**0.0016**
Antimony	49.6	J	--	--	NC	**--**	0.010	0.0059	NC	**0.016**
Arsenic	1.7	J	3.0E-09	2.6E-10	NC	**3.3E-09**	0.0005	0.00004	NC	**0.0005**
Barium	195	J	--	--	NC	**--**	0.000080	0.000100	NC	**0.00018**
Beryllium	0.87	J	--	--	NC	**--**	0.00004	0.0004	NC	**0.0005**
Cadmium	3.8	J	--	--	NC	**--**	0.00062	0.0011	NC	**0.0017**
Cobalt	11	J	--	--	NC	**--**	0.003	0.00010	NC	**0.0031**
Copper	79.2		--	--	NC	**--**	0.0001600	0.00001400	NC	**0.00017**
Manganese (non-diet)	384		--	--	NC	**--**	0.001300	0.002900	NC	**0.0042**
Mercury	1.8		--	--	NC	**--**	0.00049	0.00061	NC	**0.0011**
Nickel	43.9		--	--	NC	**--**	0.00018	0.00008	NC	**0.0003**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	29.7	J	--	--	NC	**--**	0.0005	0.00160	NC	**0.0021**
			3.2E-09	**2.6E-10**	**NC**		**0.018**	**0.013**	**NC**	
					Total Risk	**3.4E-09**			**Hazard Index**	**0.031**
Chromium [2]										
Chromium (III)	28.9		--	--	NC	**--**	0.000002	0.000011	NC	**0.0000126**
Chromium (VI)	28.9		1.7E-08	1.2E-07	NC	**1.4E-07**	0.001	0.006	NC	**0.00629**
Pathway Risk (including Chromium (III))			**3.2E-09**	**2.6E-10**	NC	**3.4E-09**	**0.018**	**0.013**	NC	**0.031**
					Total Risk (including Chromium(III))	**3.4E-09**			**Total Hazard (including Chromium(III))**	**0.031**
Pathway Risk (including Chromium (VI))			**2.0E-08**	**1.2E-07**	NC	**1.4E-07**	**0.019**	**0.019**	NC	**0.0063**
					Total Risk (including Chromium(VI))	**1.4E-07**			**Total Hazard (including Chromium(VI))**	**0.038**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.41
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration (1) (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11		1.1E-06	--	NC	**1.1E-06**	0.011	--	NC	**0.011**
Metals										
Aluminum	17700		--	--	NC	**--**	0.3400	0.0004700	NC	**0.34**
Antimony	49.6	J	--	--	NC	**--**	2.4	0.022	NC	**2.4**
Arsenic	1.7	J	1.8E-05	2.4E-08	NC	**1.8E-05**	0.11	0.00015	NC	**0.11**
Barium	195	J	--	--	NC	**--**	0.0190	0.000370	NC	**0.019**
Beryllium	0.87	J	--	--	NC	**--**	0.008	0.0017	NC	**0.010**
Cadmium	3.8	J	--	--	NC	**--**	0.15	0.0041	NC	**0.15**
Cobalt	11	J	--	--	NC	**--**	0.7	0.00039	NC	**0.71**
Copper	79.2		--	--	NC	**--**	0.0380	0.0000530	NC	**0.038**
Manganese (non-diet)	384		--	--	NC	**--**	0.3100	0.011000	NC	**0.32**
Mercury	1.8		--	--	NC	**--**	0.12	0.00230	NC	**0.12**
Nickel	43.9		--	--	NC	**--**	0.04	0.00029	NC	**0.042**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	29.7	J	--	--	NC	**--**	0.11	0.00610	NC	**0.12**
			1.9E-05	**2.4E-08**	**NC**		**4.4**	**0.049**	**NC**	
					Total Risk	**1.9E-05**			**Hazard Index**	**4.4**
Chromium (2)										
Chromium (III)	28.9		--	--	NC	**--**	0.000370	0.000040	NC	**0.00041**
Chromium (VI)	28.9		9.9E-05	1.1E-05	NC	**1.1E-04**	0.190	0.021	NC	**0.21**
Pathway Risk (including Chromium (III))			**1.9E-05**	**2.4E-08**	NC	**1.9E-05**	**4.4**	**0.049**	NC	**4.4**
					Total Risk (including Chromium(III))	**1.9E-05**			**Total Hazard (including Chromium(III))**	**4.4**
Pathway Risk (including Chromium (VI))			**1.2E-04**	**2.4E-08**	NC	**1.2E-04**	**4.6**	**0.070**	NC	**4.6**
					Total Risk (including Chromium(VI))	**1.3E-04**			**Total Hazard (including Chromium(VI))**	**4.6**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.42
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	11	1.4E-07	--	NC	**1.4E-07**	0.0019	0.0011	--	--	NC	**0.0019**	**0.0011**
Metals												
Aluminum	17700	--	--	NC	**--**	0.06100	0.04000	0.00005000	0.00002200	NC	**0.0611**	**0.0400**
Antimony	49.6 J	--	--	NC	**--**	0.42	0.25	0.0024	0.0010	NC	**0.42**	**0.25**
Arsenic	1.7 J	2.2E-06	1.50E-09	NC	**2.2E-06**	0.02	0.012	0.00002	0.00001	NC	**0.02**	**0.012**
Barium	195 J	--	--	NC	**--**	0.00330	0.00200	0.0000400	0.0000170	NC	**0.003**	**0.0020**
Beryllium	0.87 J	--	--	NC	**--**	0.0015	0.0009	0.0002	0.0001	NC	**0.002**	**0.0010**
Cadmium	3.8 J	--	--	NC	**--**	0.026	0.016	0.0004	0.0002	NC	**0.026**	**0.016**
Cobalt	11 J	--	--	NC	**--**	0.1	0.08	0.00004	0.00002	NC	**0.1**	**0.08**
Copper	79.2	--	--	NC	**--**	0.00680	0.00410	0.00000560	0.00000240	NC	**0.00681**	**0.00410**
Manganese (non-diet)	384	--	--	NC	**--**	0.05500	0.03300	0.0011000	0.0004900	NC	**0.05610**	**0.03349**
Mercury	1.8	--	--	NC	**--**	0.021	0.012	0.00024	0.00011	NC	**0.021**	**0.012**
Nickel	43.9	--	--	NC	**--**	0.008	0.005	0.00003	0.00001	NC	**0.008**	**0.005**
Thallium	1.2 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	29.7 J	--	--	NC	**--**	0.020	0.012	0.00065	0.00028	NC	**0.021**	**0.012**
		2.3E-06	**1.5E-09**	**NC**		**0.77**	**0.46**	**0.005**	**0.0022**	**NC**		
				Total Risk	**2.3E-06**					**Hazard Index**	**0.78**	**0.46**
Chromium [2]												
Chromium (III)	28.9	--	--	NC	**--**	0.00007	0.00004	0.000004	0.000002	NC	**0.00007**	**0.00004**
Chromium (VI)	28.9	1.3E-05	6.90E-07	NC	**1.4E-05**	0.03	0.020	0.00220	0.00095	NC	**0.04**	**0.021**
Pathway Risk (including Chromium (III))		**2.3E-06**	**1.5E-09**	NC	**2.3E-06**	**0.77**	**0.46**	**0.005**	**0.0022**	NC	**0.78**	**0.465**
				Total Risk (including Chromium(III))	**2.3E-06**					**Total Hazard (including Chromium(III))**	**0.78**	**0.46**
Pathway Risk (including Chromium (VI))		**1.5E-05**	**1.5E-09**	NC	**1.5E-05**	**0.81**	**0.48**	**0.007**	**0.003**	NC		
				Total Risk (including Chromium(VI))	**1.6E-05**					**Total Hazard (including Chromium(VI))**	**0.81**	**0.49**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.43
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 5
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	10 U	--	--	NC	--	--	--	--	--	NC	--	--
Metals												
Aluminum	821	--	--	NC	--	0.041	0.025	0.00022	0.00014	NC	**0.041**	**0.025**
Antimony	28.1 J	--	--	NC	--	3.5	2.1	0.13	0.079	NC	**3.6**	**2.2**
Arsenic	1.4 U	--	--	NC	--	--	--	--	--	NC	--	--
Barium	82.8 J	--	--	NC	--	0.021	0.012	0.0016	0.0010	NC	**0.023**	**0.013**
Beryllium	0.4 U	--	--	NC	--	--	--	--	--	NC	--	--
Cadmium	2.1 U	--	--	NC	--	--	--	--	--	NC	--	--
Cobalt	4.4 U	--	--	NC	--	--	--	--	--	NC	--	--
Copper	3.1 U	--	--	NC	--	--	--	--	--	NC	--	--
Manganese (non-diet)	55	--	--	NC	--	0.11	0.069	0.016	0.010	NC	**0.13**	**0.079**
Mercury	0.04 U	--	--	NC	--	--	--	--	--	NC	--	--
Nickel	4 U	--	--	NC	--	--	--	--	--	NC	--	--
Thallium	1.2 U	--	--	NC	--	--	--	--	--	NC	--	--
Vanadium	3.7 U	--	--	NC	--	--	--	--	--	NC	--	--
		--	**--**	**NC**	**--**	**3.7**	**2.2**	**0.15**	**0.090**	**NC**	**3.8**	**2.3**
				Total Risk	**0.0E+00**					**Hazard Index**	**3.8**	**2.3**
Chromium [2]												
Chromium (III)	2.6 J	--	--	NC	--	0.000086	0.000052	0.000036	0.000022	NC	**0.00012**	**0.000074**
Chromium (VI)	2.6 J	1.7E-05	7.4E-06	NC	**2.4E-05**	0.043	0.026	0.019	0.012	NC	**0.062**	**0.038**
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	**--**	**3.7**	**2.2**	**0.15**	**0.090**	NC	**3.8**	**2.3**
				Total Risk (including Chromium(III))	**0.0E+00**					**Total Hazard (including Chromium(III))**	**3.8**	**2.3**
Pathway Risk (including Chromium (VI))		**1.7E-05**	**0.0E+00**	NC	**1.7E-05**	**3.7**	**2.2**	**0.17**	**0.10**	NC	**3.9**	**2.3**
				Total Risk (including Chromium(VI))	**2.4E-05**					**Total Hazard (including Chromium(VI))**	**3.9**	**2.3**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.44
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 5
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [(1)] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	10	U	--	--	NC	**--**	--	--	NC	**--**
Metals										
Aluminum	821		--	--	NC	**--**	0.000067	0.0000059	NC	**0.000073**
Antimony	28.1	J	--	--	NC	**--**	0.0058	0.0033	NC	**0.0091**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	82.8	J	--	--	NC	**--**	0.000034	0.000042	NC	**0.000076**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.1	U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	4.4	U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	NC	**--**
Manganese (non-diet)	55		--	--	NC	**--**	0.00019	0.00041	NC	**0.00060**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4	U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			--	**--**	**NC**		**0.0061**	**0.0038**	**NC**	
					Total Risk	**0.0E+00**			**Hazard Index**	**0.010**
Chromium [(2)]										
Chromium (III)	2.6	J	--	--	NC	**--**	0.0000016	0.000011	NC	**0.000013**
Chromium (VI)	2.6	J	1.5E-09	1.1E-08	NC	**1.3E-08**	0.00079	0.0055	NC	**0.0063**
Pathway Risk (including Chromium (III))			**0.0E+00**	**0.0E+00**	NC	**--**	**0.0061**	**0.0038**	NC	**0.010**
					Total Risk (including Chromium(III))	**0.0E+00**			**Total Hazard (including Chromium(III))**	**0.010**
Pathway Risk (including Chromium (VI))			**1.5E-09**	**1.1E-08**	NC	**1.3E-08**	**0.0069**	**0.0093**	NC	**0.0063**
					Total Risk (including Chromium(VI))	**1.3E-08**			**Total Hazard (including Chromium(VI))**	**0.016**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.45
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 5
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
Bis(2-Ethylhexyl)phthalate	10 U	--	--	NC	**--**	--	--	NC	**--**
Metals									
Aluminum	821	--	--	NC	**--**	0.016	0.000022	NC	**0.016**
Antimony	28.1 J	--	--	NC	**--**	1.4	0.013	NC	**1.4**
Arsenic	1.4 U	--	--	NC	**--**	--	--	NC	**--**
Barium	82.8 J	--	--	NC	**--**	0.0080	0.00016	NC	**0.0082**
Beryllium	0.4 U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.1 U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	4.4 U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.1 U	--	--	NC	**--**	--	--	NC	**--**
Manganese (non-diet)	55	--	--	NC	**--**	0.044	0.0015	NC	**0.046**
Mercury	0.04 U	--	--	NC	**--**	--	--	NC	**--**
Nickel	4 U	--	--	NC	**--**	--	--	NC	**--**
Thallium	1.2 U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7 U	--	--	NC	**--**	--	--	NC	**--**
		--	**--**	**NC**		**1.5**	**0.015**	**NC**	
				Total Risk	**0.0E+00**			**Hazard Index**	**1.5**
Chromium [2]									
Chromium (III)	2.6 J	--	--	NC	**--**	0.000033	0.000040	NC	**0.000073**
Chromium (VI)	2.6 J	8.9E-06	9.9E-07	NC	**9.9E-06**	0.017	0.021	NC	**0.038**
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	**--**	**1.5**	**0.015**	NC	**1.5**
				Total Risk (including Chromium(III))	**0.0E+00**			**Total Hazard (including Chromium(III))**	**1.5**
Pathway Risk (including Chromium (VI))		**8.9E-06**	**0.0E+00**	NC	**8.9E-06**	**1.5**	**0.036**	NC	**1.5**
				Total Risk (including Chromium(VI))	**9.9E-06**			**Total Hazard (including Chromium(VI))**	**1.5**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.46
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 5
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds													
Bis(2-Ethylhexyl)phthalate	10	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Metals													
Aluminum	821		--	--	NC	**--**	0.0028	0.0017	0.0000023	0.0000010	NC	**0.0028**	**0.0017**
Antimony	28.1	J	--	--	NC	**--**	0.24	0.14	0.0013	0.00058	NC	**0.24**	**0.14**
Arsenic	1.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	82.8	J	--	--	NC	**--**	0.0014	0.00085	0.000017	0.0000073	NC	**0.0014**	**0.00086**
Beryllium	0.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.1	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cobalt	4.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Manganese (non-diet)	55		--	--	NC	**--**	0.0078	0.0047	0.00016	0.000070	NC	**0.0080**	**0.0048**
Mercury	0.04	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Thallium	1.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
			--	**--**	**NC**		**0.25**	**0.15**	**0.0015**	**0.00066**	**NC**		
					Total Risk	**0.0E+00**					**Hazard Index**	**0.25**	**0.15**
Chromium [2]													
Chromium (III)	2.6	J	--	--	NC	**--**	0.0000059	0.000040	0.00000038	0.00000016	NC	**0.0000063**	**0.000040**
Chromium (VI)	2.6	J	1.1E-06	6.20E-08	NC	**1.2E-06**	0.0030	0.020	0.00020	0.000085	NC	**0.0032**	**0.020**
Pathway Risk (including Chromium (III))			**0.0E+00**	**0.0E+00**	NC	**--**	**0.25**	**0.15**	**0.0015**	**0.00066**	NC	**0.25**	**0.148**
					Total Risk (including Chromium(III))	**0.0E+00**					**Total Hazard (including Chromium(III))**	**0.25**	**0.15**
Pathway Risk (including Chromium (VI))			**1.1E-06**	**0.0E+00**	NC	**1.1E-06**	**0.26**	**0.17**	**0.0017**	**0.00074**	NC		
					Total Risk (including Chromium(VI))	**1.2E-06**					**Total Hazard (including Chromium(VI))**	**0.26**	**0.17**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.47
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 45-2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	23	4.1E-06	--	NC	**4.1E-06**	0.057	0.034	--	--	NC	**0.057**	**0.034**
Metals												
Aluminum	42 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Antimony	26.8 J	--	--	NC	**--**	3.3	2.0	0.12	0.075	NC	**3.4**	**2.1**
Arsenic	1.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	27.2 J	--	--	NC	**--**	0.0068	0.0041	0.00053	0.00033	NC	**0.0073**	**0.0044**
Beryllium	0.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.9 J	--	--	NC	**--**	0.29	0.17	0.032	0.019	NC	**0.32**	**0.19**
Cobalt	4.4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3.1 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Manganese (non-diet)	1400	--	--	NC	**--**	2.9	1.7	0.40	0.25	NC	**3.3**	**2.0**
Mercury	0.04 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	10.2 J	--	--	NC	**--**	0.025	0.015	0.00070	0.00043	NC	**0.026**	**0.015**
Thallium	1.2 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
		4.1E-06	**--**	**NC**	**4.1E-06**	**6.6**	**3.9**	**0.55**	**0.34**	**NC**	**7.1**	**4.3**
				Total Risk	**4.1E-06**					**Hazard Index**	**7.1**	**4.3**
Chromium [2]												
Chromium (III)	2.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	2.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))		**4.1E-06**	**0.0E+00**	NC	**4.1E-06**	**6.6**	**3.9**	**0.55**	**0.34**	NC	**7.1**	**4.3**
				Total Risk (including Chromium(III))	**4.1E-06**					**Total Hazard (including Chromium(III))**	**7.1**	**4.3**
Pathway Risk (including Chromium (VI))		**4.1E-06**	**0.0E+00**	NC	**4.1E-06**	**6.6**	**3.9**	**0.55**	**0.34**	NC	**7.1**	**4.3**
				Total Risk (including Chromium(VI))	**4.1E-06**					**Total Hazard (including Chromium(VI))**	**7.1**	**4.3**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.48
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 45-2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	23		3.8E-10	--	NC	**3.8E-10**	0.000095	--	NC	**0.000095**
Metals										
Aluminum	42	U	--	--	NC	**--**	--	--	NC	**--**
Antimony	26.8	J	--	--	NC	**--**	0.0055	0.0032	NC	**0.0087**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	27.2	J	--	--	NC	**--**	0.000011	0.000014	NC	**0.000025**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.9	J	--	--	NC	**--**	0.00048	0.00083	NC	**0.0013**
Cobalt	4.4	U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	NC	**--**
Manganese (non-diet)	1400		--	--	NC	**--**	0.0048	0.010	NC	**0.01480**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	10.2	J	--	--	NC	**--**	0.000042	0.000018	NC	**0.0001**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			3.8E-10	**--**	**NC**		**0.011**	**0.014**	**NC**	
					Total Risk	**3.8E-10**			**Hazard Index**	**0.025**
Chromium [2]										
Chromium (III)	2.6	U	--	--	NC	**--**	--	0.000011	NC	**0.000011**
Chromium (VI)	2.6	U	--	--	NC	**--**	--	0.0055	NC	**0.0055**
Pathway Risk (including Chromium (III))			**3.8E-10**	**0.0E+00**	NC	**3.8E-10**	**0.011**	**0.014**	NC	**0.025**
					Total Risk (including Chromium(III))	**3.8E-10**			**Total Hazard (including Chromium(III))**	**0.025**
Pathway Risk (including Chromium (VI))			**3.8E-10**	**0.0E+00**	NC	**0.0E+00**	**0.011**	**0.020**	NC	**0.0055**
					Total Risk (including Chromium(VI))	**3.8E-10**			**Total Hazard (including Chromium(VI))**	**0.030**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.49
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 45-2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	23		2.2E-06	--	NC	**2.2E-06**	0.022	--	NC	**0.022**
Metals										
Aluminum	42	U	--	--	NC	**--**	--	--	NC	**--**
Antimony	26.8	J	--	--	NC	**--**	1.3	0.012	NC	**1.3**
Arsenic	1.4	U	--	--	NC	**--**	--	--	NC	**--**
Barium	27.2	J	--	--	NC	**--**	0.0026	0.000052	NC	**0.0027**
Beryllium	0.4	U	--	--	NC	**--**	--	--	NC	**--**
Cadmium	2.9	J	--	--	NC	**--**	0.11	0.0031	NC	**0.11**
Cobalt	4.4	U	--	--	NC	**--**	--	--	NC	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	NC	**--**
Manganese (non-diet)	1400		--	--	NC	**--**	1.1	0.039	NC	**1.1**
Mercury	0.04	U	--	--	NC	**--**	--	--	NC	**--**
Nickel	10.2	J	--	--	NC	**--**	0.010	0.000068	NC	**0.010**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	NC	**--**
			2.2E-06	**--**	**NC**		**2.5**	**0.054**	**NC**	
					Total Risk	**2.2E-06**			**Hazard Index**	**2.6**
Chromium [2]										
Chromium (III)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	2.6	U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))			**2.2E-06**	**0.0E+00**	NC	**2.2E-06**	**2.5**	**0.054**	NC	**2.6**
					Total Risk (including Chromium(III))	**2.2E-06**			**Total Hazard (including Chromium(III))**	**2.6**
Pathway Risk (including Chromium (VI))			**2.2E-06**	**0.0E+00**	NC	**2.2E-06**	**2.5**	**0.054**	NC	**2.6**
					Total Risk (including Chromium(VI))	**2.2E-06**			**Total Hazard (including Chromium(VI))**	**2.6**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.50
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 45-2
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds													
Bis(2-Ethylhexyl)phthalate	23		2.8E-07	--	NC	**2.8E-07**	0.0039	0.0024	--	--	NC	**0.0039**	**0.0024**
Metals													
Aluminum	42	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Antimony	26.8	J	--	--	NC	**--**	0.23	0.14	0.0013	0.00055	NC	**0.23**	**0.14**
Arsenic	1.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	27.2	J	--	--	NC	**--**	0.00047	0.00028	0.0000055	0.0000024	NC	**0.00048**	**0.00028**
Beryllium	0.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cadmium	2.9	J	--	--	NC	**--**	0.020	0.012	0.00033	0.00014	NC	**0.020**	**0.012**
Cobalt	4.4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3.1	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Manganese (non-diet)	1400		--	--	NC	**--**	0.20	0.12	0.0042	0.0018	NC	**0.20**	**0.12**
Mercury	0.04	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	10.2	J	--	--	NC	**--**	0.0017	0.0010	0.0000073	0.0000031	NC	**0.0017**	**0.0010**
Thallium	1.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	3.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
			2.8E-07	**--**	**NC**		**0.46**	**0.28**	**0.0058**	**0.0025**	**NC**		
					Total Risk	**2.8E-07**					**Hazard Index**	**0.46**	**0.28**
Chromium [2]													
Chromium (III)	2.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	2.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))			**2.8E-07**	**0.0E+00**	NC	**2.8E-07**	**0.46**	**0.28**	**0.0058**	**0.0025**	NC	**0.46**	**0.278**
					Total Risk (including Chromium(III))	**2.8E-07**					**Total Hazard (including Chromium(III))**	**0.46**	**0.28**
Pathway Risk (including Chromium (VI))			**2.8E-07**	**0.0E+00**	NC	**2.8E-07**	**0.46**	**0.28**	**0.0058**	**0.0025**	NC		
					Total Risk (including Chromium(VI))	**2.8E-07**					**Total Hazard (including Chromium(VI))**	**0.46**	**0.28**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.51
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 45-3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	11 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Metals												
Aluminum	7510	--	--	NC	**--**	0.37	0.23	0.0021	0.0013	NC	**0.372**	**0.231**
Antimony	36.7 J	--	--	NC	**--**	4.6	2.7	0.17	0.10	NC	**4.8**	**2.8**
Arsenic	1.8 J	3.5E-05	1.9E-07	NC	**3.5E-05**	0.30	0.18	0.0016	0.0010	NC	**0.3**	**0.18**
Barium	62.1 J	--	--	NC	**--**	0.015	0.010	0.0012	0.00075	NC	**0.0162**	**0.0108**
Beryllium	0.52 J	--	--	NC	**--**	0.013	0.0080	0.010	0.0062	NC	**0.02**	**0.01**
Cadmium	3.2 J	--	--	NC	**--**	0.32	0.19	0.035	0.022	NC	**0.36**	**0.21**
Cobalt	14.6 J	--	--	NC	**--**	2.4	1.5	0.0053	0.0033	NC	**2.4**	**1.5**
Copper	11.9 J	--	--	NC	**--**	0.015	0.0090	0.000081	0.000050	NC	**0.015**	**0.009**
Manganese (non-diet)	625	--	--	NC	**--**	1.3	0.80	0.18	0.11	NC	**1.5**	**0.9**
Mercury	0.08 J	--	--	NC	**--**	0.013	0.010	0.0010	0.00064	NC	**0.01**	**0.01**
Nickel	30.7 J	--	--	NC	**--**	0.077	0.046	0.0021	0.0013	NC	**0.079**	**0.047**
Thallium	1.2 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	11.7 J	--	--	NC	**--**	0.12	0.070	0.025	0.015	NC	**0.1**	**0.09**
		3.5E-05	**1.9E-07**	**NC**	**3.5E-05**	**9.5**	**5.8**	**0.43**	**0.26**	**NC**	**10.0**	**6.0**
				Total Risk	**3.5E-05**					**Hazard Index**	**10.0**	**6.0**
Chromium [2]												
Chromium (III)	16.1	--	--	NC	**--**	0.00054	0.00032	0.00023	0.00014	NC	**0.00077**	**0.000460**
Chromium (VI)	16.1	1.0E-04	4.6E-05	NC	**1.5E-04**	0.27	0.16	0.12	0.070	NC	**0.390**	**0.230**
Pathway Risk (including Chromium (III))		**3.5E-05**	**1.9E-07**	NC	**3.5E-05**	**9.5**	**5.8**	**0.43**	**0.26**	NC	**10**	**6.0**
				Total Risk (including Chromium(III))	**3.5E-05**					**Total Hazard (including Chromium(III))**	**10**	**6.0**
Pathway Risk (including Chromium (VI))		**1.4E-04**	**1.9E-07**	NC	**1.4E-04**	**9.8**	**5.9**	**0.55**	**0.33**	NC	**10**	**6.2**
				Total Risk (including Chromium(VI))	**1.8E-04**					**Total Hazard (including Chromium(VI))**	**10**	**6.2**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.52
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 45-3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
Bis(2-Ethylhexyl)phthalate	11 U	--	--	NC	**--**	--	--	NC	**--**
Metals									
Aluminum	7510	--	--	NC	**--**	0.00062	0.000054	NC	**0.00067**
Antimony	36.7 J	--	--	NC	**--**	0.0075	0.0044	NC	**0.012**
Arsenic	1.8 J	3.2E-09	2.8E-10	NC	**3.5E-09**	0.00049	0.000043	NC	**0.00053**
Barium	62.1 J	--	--	NC	**--**	0.000026	0.000032	NC	**0.000058**
Beryllium	0.52 J	--	--	NC	**--**	0.000021	0.00026	NC	**0.00028**
Cadmium	3.2 J	--	--	NC	**--**	0.00053	0.00091	NC	**0.0014**
Cobalt	14.6 J	--	--	NC	**--**	0.0040	0.00014	NC	**0.0041**
Copper	11.9 J	--	--	NC	**--**	0.000024	0.0000021	NC	**0.000026**
Manganese (non-diet)	625	--	--	NC	**--**	0.0021	0.0046	NC	**0.0067**
Mercury	0.08 J	--	--	NC	**--**	0.000022	0.000027	NC	**0.000049**
Nickel	30.7 J	--	--	NC	**--**	0.00013	0.000055	NC	**0.00019**
Thallium	1.2 U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	11.7 J	--	--	NC	**--**	0.00019	0.00064	NC	**0.00083**
		3.2E-09	**2.8E-10**	**NC**		**0.016**	**0.011**	**NC**	
				Total Risk	**3.5E-09**			**Hazard Index**	**0.027**
Chromium [2]									
Chromium (III)	16.1	--	--	NC	**--**	0.00000088	0.0000059	NC	**0.0000068**
Chromium (VI)	16.1	9.5E-09	6.6E-08	NC	**7.6E-08**	0.00044	0.0031	NC	**0.0035**
Pathway Risk (including Chromium (III))		**3.2E-09**	**2.8E-10**	NC	**3.5E-09**	**0.016**	**0.011**	NC	**0.027**
				Total Risk (including Chromium(III))	**3.5E-09**			**Total Hazard (including Chromium(III))**	**0.027**
Pathway Risk (including Chromium (VI))		**1.3E-08**	**6.6E-08**	NC	**7.6E-08**	**0.016**	**0.014**	NC	**0.0035**
				Total Risk (including Chromium(VI))	**7.9E-08**			**Total Hazard (including Chromium(VI))**	**0.030**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.53
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 45-3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	**--**	--	--	NC	**--**
Metals										
Aluminum	7510		--	--	NC	**--**	0.14	0.00020	NC	**0.14**
Antimony	36.7	J	--	--	NC	**--**	1.8	0.016	NC	**1.8**
Arsenic	1.8	J	1.9E-05	2.6E-08	NC	**1.9E-05**	0.12	0.00016	NC	**0.12**
Barium	62.1	J	--	--	NC	**--**	0.0060	0.00012	NC	**0.0061**
Beryllium	0.52	J	--	--	NC	**--**	0.0050	0.0010	NC	**0.0060**
Cadmium	3.2	J	--	--	NC	**--**	0.12	0.0034	NC	**0.12**
Cobalt	14.6	J	--	--	NC	**--**	0.94	0.00052	NC	**0.94**
Copper	11.9	J	--	--	NC	**--**	0.0057	0.0000080	NC	**0.0057**
Manganese (non-diet)	625		--	--	NC	**--**	0.50	0.017	NC	**0.52**
Mercury	0.08	J	--	--	NC	**--**	0.0050	0.00010	NC	**0.0051**
Nickel	30.7	J	--	--	NC	**--**	0.030	0.00021	NC	**0.030**
Thallium	1.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	11.7	J	--	--	NC	**--**	0.045	0.0024	NC	**0.047**
			1.9E-05	**2.6E-08**	**NC**		**3.7**	**0.041**	**NC**	
					Total Risk	**1.9E-05**			**Hazard Index**	**3.8**
Chromium [2]										
Chromium (III)	16.1		--	--	NC	**--**	0.00021	0.000022	NC	**0.00023**
Chromium (VI)	16.1		5.5E-05	6.1E-06	NC	**6.1E-05**	0.10	0.011	NC	**0.11**
Pathway Risk (including Chromium (III))			**1.9E-05**	**2.6E-08**	NC	**1.9E-05**	**3.7**	**0.041**	NC	**3.8**
					Total Risk (including Chromium(III))	**1.9E-05**			**Total Hazard (including Chromium(III))**	**3.8**
Pathway Risk (including Chromium (VI))			**7.4E-05**	**2.6E-08**	NC	**7.4E-05**	**3.8**	**0.052**	NC	**3.9**
					Total Risk (including Chromium(VI))	**8.0E-05**			**Total Hazard (including Chromium(VI))**	**3.9**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.54
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 45-3
Seneca Army Depot Activity

Analyte	Exposure Point Concentration (1) (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	11 U	--	--	NC	--	--	--	--	--	NC	--	--
Metals												
Aluminum	7510	--	--	NC	--	0.026	0.015	0.000021	0.0000092	NC	0.026	0.015
Antimony	36.7 J	--	--	NC	--	0.31	0.19	0.0017	0.00075	NC	0.31	0.19
Arsenic	1.8 J	2.4E-06	1.60E-09	NC	2.4E-06	0.021	0.012	0.000017	0.0000074	NC	0.021	0.012
Barium	62.1 J	--	--	NC	--	0.0011	0.00064	0.000013	0.0000055	NC	0.0011	0.00065
Beryllium	0.52 J	--	--	NC	--	0.00089	0.00053	0.00011	0.000046	NC	0.0010	0.00058
Cadmium	3.2 J	--	--	NC	--	0.022	0.013	0.00037	0.00016	NC	0.022	0.013
Cobalt	14.6 J	--	--	NC	--	0.17	0.10	0.000056	0.000024	NC	0.17	0.10
Copper	11.9 J	--	--	NC	--	0.0010	0.00061	0.00000085	0.00000037	NC	0.0010	0.00061
Manganese (non-diet)	625	--	--	NC	--	0.089	0.054	0.0019	0.00080	NC	0.091	0.055
Mercury	0.08 J	--	--	NC	--	0.00090	0.00055	0.000011	0.0000047	NC	0.00091	0.00055
Nickel	30.7 J	--	--	NC	--	0.0052	0.0032	0.000022	0.0000094	NC	0.0052	0.0032
Thallium	1.2 U	--	--	NC	--	--	--	--	--	NC	--	--
Vanadium	11.7 J	--	--	NC	--	0.0080	0.0048	0.00026	0.00011	NC	0.0083	0.0049
		2.4E-06	**1.6E-09**	**NC**		**0.66**	**0.39**	**0.0045**	**0.0019**	**NC**		
				Total Risk	**2.4E-06**					**Hazard Index**	**0.66**	**0.40**
Chromium (2)												
Chromium (III)	16.1	--	--	NC	--	0.0000370	0.000020	0.0000024	0.0000010	NC	0.000039	0.000021
Chromium (VI)	16.1	7.1E-06	3.8E-07	NC	7.5E-06	0.0180	0.011	0.0012	0.00053	NC	0.019	0.012
Pathway Risk (including Chromium (III))		**2.4E-06**	**1.6E-09**	NC	**2.4E-06**	**0.66**	**0.39**	**0.0045**	**0.0019**	NC	**0.66**	**0.40**
				Total Risk (including Chromium(III))	**2.4E-06**					**Total Hazard (including Chromium(III))**	**0.66**	**0.40**
Pathway Risk (including Chromium (VI))		**9.5E-06**	**1.6E-09**	NC	**9.5E-06**	**0.67**	**0.41**	**0.0057**	**0.0025**	NC		
				Total Risk (including Chromium(VI))	**9.9E-06**					**Total Hazard (including Chromium(VI))**	**0.68**	**0.41**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.55
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Resident
Monitoring Well 45-4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds													
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Metals													
Aluminum	63300		--	--	NC	**--**	3.2	1.9	0.017	0.011	NC	**3.2**	**1.9**
Antimony	21.6	UJ	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Arsenic	9.5	J	1.8E-04	1.0E-06	NC	**1.8E-04**	1.6	0.95	0.0087	0.0053	NC	**1.6**	**0.96**
Barium	751		--	--	NC	**--**	0.19	0.11	0.015	0.0090	NC	**0.21**	**0.12**
Beryllium	5		--	--	NC	**--**	0.12	0.075	0.098	0.060	NC	**0.22**	**0.14**
Cadmium	4	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cobalt	94.4		--	--	NC	**--**	16	9.4	0.034	0.021	NC	**16**	**9.4**
Copper	123		--	--	NC	**--**	0.15	0.092	0.00084	0.00052	NC	**0.15**	**0.093**
Manganese (non-diet)	4640		--	--	NC	**--**	9.6	5.8	1.3	0.81	NC	**11**	**6.6**
Mercury	0.29		--	--	NC	**--**	0.048	0.029	0.0038	0.0023	NC	**0.052**	**0.031**
Nickel	209		--	--	NC	**--**	0.52	0.31	0.014	0.0088	NC	**0.53**	**0.32**
Thallium	3.4	J	--	--	NC	**--**	17	10	0.093	0.057	NC	**17**	**10**
Vanadium	93.1		--	--	NC	**--**	0.93	0.56	0.20	0.12	NC	**1.1**	**0.68**
			1.8E-04	**1.0E-06**	**NC**	**1.8E-04**	**49**	**29**	**1.8**	**1.1**	**NC**	**51**	**30**
					Total Risk	**1.8E-04**					**Hazard Index**	**51**	**30**
Chromium [2]													
Chromium (III)	106		--	--	NC	**--**	0.0035	0.00210	0.00150	0.00091	NC	**0.0050**	**0.0030**
Chromium (VI)	106		6.8E-04	3.0E-04	NC	**9.8E-04**	1.8	1.10	0.77	0.470	NC	**2.6**	**1.6**
Pathway Risk (including Chromium (III))			**1.8E-04**	**1.0E-06**	NC	**1.8E-04**	**49**	**29**	**1.8**	**1.1**	NC	**51**	**30**
					Total Risk (including Chromium(III))	**1.8E-04**					**Total Hazard (including Chromium(III))**	**51**	**30**
Pathway Risk (including Chromium (VI))			**8.6E-04**	**1.0E-06**	NC	**8.6E-04**	**51**	**30**	**2.6**	**1.6**	NC	**54**	**32**
					Total Risk (including Chromium(VI))	**1.2E-03**					**Total Hazard (including Chromium(VI))**	**54**	**32**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.56
Human Health Risk Evaluation
Potable Uses of Groundwater
Hypothetical Future Excavation/Construction Worker
Monitoring Well 45-4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	**--**	--	--	NC	**--**
Metals										
Aluminum	63300		--	--	NC	**--**	0.0052	0.00045	NC	**0.0057**
Antimony	21.6	UJ	--	--	NC	**--**	--	--	NC	**--**
Arsenic	9.5	J	1.7E-08	1.5E-09	NC	**1.9E-08**	0.0026	0.00023	NC	**0.0028**
Barium	751		--	--	NC	**--**	0.00031	0.00038	NC	**0.00069**
Beryllium	5		--	--	NC	**--**	0.00021	0.0025	NC	**0.0027**
Cadmium	4	U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	94.4		--	--	NC	**--**	0.026	0.00090	NC	**0.027**
Copper	123		--	--	NC	**--**	0.00025	0.000022	NC	**0.00027**
Manganese (non-diet)	4640		--	--	NC	**--**	0.016	0.034	NC	**0.050**
Mercury	0.29		--	--	NC	**--**	0.000079	0.00010	NC	**0.00018**
Nickel	209		--	--	NC	**--**	0.00086	0.00037	NC	**0.0012**
Thallium	3.4	J	--	--	NC	**--**	0.028	0.0024	NC	**0.030**
Vanadium	93.1		--	--	NC	**--**	0.0015	0.0051	NC	**0.0066**
			1.7E-08	**1.5E-09**	**NC**		**0.081**	**0.046**	**NC**	
					Total Risk	**1.9E-08**			**Hazard Index**	**0.13**
Chromium [2]										
Chromium (III)	106		--	--	NC	**--**	0.0000058	0.000039	NC	**0.000045**
Chromium (VI)	106		6.2E-08	4.3E-07	NC	**4.9E-07**	0.0029	0.020	NC	**0.023**
Pathway Risk (including Chromium (III))			**1.7E-08**	**1.5E-09**	NC	**1.9E-08**	**0.081**	**0.046**	NC	**0.13**
					Total Risk (including Chromium(III))	**1.9E-08**			**Total Hazard (including Chromium(III))**	**0.13**
Pathway Risk (including Chromium (VI))			**7.9E-08**	**4.3E-07**	NC	**4.9E-07**	**0.084**	**0.066**	NC	**0.023**
					Total Risk (including Chromium(VI))	**5.1E-07**			**Total Hazard (including Chromium(VI))**	**0.15**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.57
Human Health Risk Evaluation
Potable Uses of Groundwater
Future Park Worker
Monitoring Well 45-4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration (1) (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds										
Bis(2-Ethylhexyl)phthalate	11	U	--	--	NC	**--**	--	--	NC	**--**
Metals										
Aluminum	63300		--	--	NC	**--**	1.2	0.0017	NC	**1.2**
Antimony	21.6	UJ	--	--	NC	**--**	--	--	NC	**--**
Arsenic	9.5	J	9.8E-05	1.4E-07	NC	**9.8E-05**	0.61	0.00085	NC	**0.61**
Barium	751		--	--	NC	**--**	0.072	0.0014	NC	**0.073**
Beryllium	5		--	--	NC	**--**	0.048	0.0095	NC	**0.058**
Cadmium	4	U	--	--	NC	**--**	--	--	NC	**--**
Cobalt	94.4		--	--	NC	**--**	6.1	0.0034	NC	**6.1**
Copper	123		--	--	NC	**--**	0.059	0.000082	NC	**0.059**
Manganese (non-diet)	4640		--	--	NC	**--**	3.7	0.13	NC	**3.8**
Mercury	0.29		--	--	NC	**--**	0.019	0.00037	NC	**0.019**
Nickel	209		--	--	NC	**--**	0.20	0.0014	NC	**0.20**
Thallium	3.4	J	--	--	NC	**--**	6.5	0.0091	NC	**6.5**
Vanadium	93.1		--	--	NC	**--**	0.36	0.019	NC	**0.38**
			9.8E-05	**1.4E-07**	**NC**		**19**	**0.18**	**NC**	
					Total Risk	**9.8E-05**			**Hazard Index**	**19**
Chromium (2)										
Chromium (III)	106		--	--	NC	**--**	0.0014	0.00015	NC	**0.0016**
Chromium (VI)	106		3.6E-04	4.0E-05	NC	**4.0E-04**	0.68	0.076	NC	**0.76**
Pathway Risk (including Chromium (III))			**9.8E-05**	**1.4E-07**	NC	**9.8E-05**	**19**	**0.177**	NC	**19**
					Total Risk (including Chromium(III))	**9.8E-05**			**Total Hazard (including Chromium(III))**	**19**
Pathway Risk (including Chromium (VI))			**4.6E-04**	**1.4E-07**	NC	**4.6E-04**	**20**	**0.253**	NC	**20**
					Total Risk (including Chromium(VI))	**5.0E-04**			**Total Hazard (including Chromium(VI))**	**20**

(1) Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.58
Human Health Risk Evaluation
Potable Uses of Groundwater
Current and Future Recreational User
Monitoring Well 45-4
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	11 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Metals												
Aluminum	63300	--	--	NC	**--**	0.22	0.13	0.00018	0.000078	NC	**0.22**	**0.13**
Antimony	21.6 UJ	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Arsenic	9.5 J	1.3E-05	8.50E-09	NC	**1.3E-05**	0.11	0.065	0.000090	0.000039	NC	**0.11**	**0.065**
Barium	751	--	--	NC	**--**	0.013	0.0077	0.00015	0.000066	NC	**0.013**	**0.0078**
Beryllium	5	--	--	NC	**--**	0.0085	0.0051	0.0010	0.00044	NC	**0.0095**	**0.0055**
Cadmium	4 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cobalt	94.4	--	--	NC	**--**	1.1	0.65	0.00036	0.00015	NC	**1.1**	**0.65**
Copper	123	--	--	NC	**--**	0.011	0.0063	0.0000088	0.0000038	NC	**0.011**	**0.0063**
Manganese (non-diet)	4640	--	--	NC	**--**	0.66	0.40	0.014	0.0059	NC	**0.67**	**0.41**
Mercury	0.29	--	--	NC	**--**	0.0033	0.0020	0.000039	0.000017	NC	**0.0033**	**0.0020**
Nickel	209	--	--	NC	**--**	0.036	0.021	0.00015	0.000064	NC	**0.036**	**0.021**
Thallium	3.4 J	--	--	NC	**--**	1.2	0.70	0.0010	0.00042	NC	**1.2**	**0.70**
Vanadium	93.1	--	--	NC	**--**	0.064	0.038	0.0020	0.00088	NC	**0.066**	**0.039**
		1.3E-05	**8.5E-09**	**NC**		**3.4**	**2.0**	**0.019**	**0.0081**	**NC**		
				Total Risk	**1.3E-05**					**Hazard Index**	**3.4**	**2.0**
Chromium [2]												
Chromium (III)	106	--	--	NC	**--**	0.00024	0.00015	0.000016	0.000010	NC	**0.00026**	**0.00016**
Chromium (VI)	106	4.7E-05	2.5E-06	NC	**5.0E-05**	0.12	0.073	0.0081	0.0030	NC	**0.13**	**0.076**
Pathway Risk (including Chromium (III))		**1.3E-05**	**8.5E-09**	NC	**1.3E-05**	**3.4**	**2.0**	**0.019**	**0.0081**	NC	**3.4**	**2.0**
				Total Risk (including Chromium(III))	**1.3E-05**					**Total Hazard (including Chromium(III))**	**3.4**	**2.0**
Pathway Risk (including Chromium (VI))		**6.0E-05**	**8.5E-09**	NC	**6.0E-05**	**3.5**	**2.1**	**0.027**	**0.011**	NC		
				Total Risk (including Chromium(VI))	**6.3E-05**					**Total Hazard (including Chromium(VI))**	**3.6**	**2.1**

[1] Exposure point concentration is the maximum detected concentration from an individual groundwater well onsite. See Table 2.12.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.59
Human Health Risk Evaluation
Summary of Risk and Hazard Associated with the Potable Uses of Groundwater
Seneca Army Depot Activity

All COPCs including chromium(III)

	Hypothetical Future Resident	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User	Hypothetical Future Resident (Child)	Hypothetical Future Resident (Adult)	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User (Child)	Current and Future Recreational User (Adult)
Monitoring Well	**Carcinogenic Risk**				**Noncarcinogenic Hazard Index**					
MW1	5.9E-06	5.4E-10	3.2E-06	4.1E-07	3.5	2.1	0.0091	1.3	0.23	0.14
MW2	NC	NC	NC	NC	4.0	2.4	0.0093	1.5	0.27	0.16
MW3	2.2E-06	2.0E-10	1.2E-06	1.5E-07	6.8	4.1	0.017	2.6	0.45	0.27
MW4	3.5E-05	3.4E-09	1.9E-05	2.3E-06	12	7.1	0.031	4.4	0.78	0.46
MW5	NC	NC	NC	NC	3.8	2.3	0.010	1.5	0.25	0.15
MW45-2	4.1E-06	3.8E-10	2.2E-06	2.8E-07	7.1	4.3	0.025	2.6	0.46	0.28
MW45-3	3.5E-05	1.9E-08	9.8E-05	1.3E-05	10	6.0	0.13	19	3.4	2.0
MW45-4	1.8E-04	1.9E-08	9.8E-05	1.3E-05	51	30	0.13	19	3.4	2.0
MW23-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW23-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW23-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

All COPCs including chromium(VI)

	Hypothetical Future Resident	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User	Hypothetical Future Resident (Child)	Hypothetical Future Resident (Adult)	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User (Child)	Current and Future Recreational User (Adult)
Monitoring Well	**Carcinogenic Risk**				**Noncarcinogenic Hazard Index**					
MW1	5.9E-06	5.4E-10	3.2E-06	4.1E-07	3.5	2.1	0.0091	1.3	0.23	0.14
MW2	3.8E-05	1.9E-08	1.6E-05	1.9E-06	4.1	2.5	0.010	1.5	0.27	0.16
MW3	2.2E-06	2.0E-10	1.2E-06	1.5E-07	6.8	4.1	0.017	2.6	0.45	0.27
MW4	3.0E-04	1.4E-07	1.3E-04	1.6E-05	12	7.5	0.038	4.6	0.81	0.49
MW5	2.4E-05	1.3E-08	9.9E-06	1.2E-06	3.9	2.3	0.016	1.5	0.26	0.17
MW45-2	4.1E-06	3.8E-10	2.2E-06	2.8E-07	7.1	4.3	0.030	2.6	0.46	0.28
MW45-3	1.8E-04	5.1E-07	5.0E-04	6.3E-05	10	6.2	0.15	20	3.6	2.1
MW45-4	1.2E-03	5.1E-07	5.0E-04	6.3E-05	54	32	0.15	20	3.6	2.1
MW23-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW23-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW23-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NC = not caluclated because no carcinogenic analytes detected
NA = no risk calculated for these wells because the only detected COPC was lead, which is addressed separately.

Table 2.60
Calculations of Blood Lead Concentrations (PbBs)
Surface Soil (0 - ≤ 2 feet bgs)
Seneca Army Depot Activity

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	ug/g or ppm	169	169
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	2.1
PbB_0	Baseline PbB	ug/dL	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	225	225
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.5**	**2.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.6	6.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.0%**	**1.0%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Table 2.61
Calculations of Blood Lead Concentrations (PbBs)
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)
Seneca Army Depot Activity

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	ug/g or ppm	139	139
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	2.1
PbB_0	Baseline PbB	ug/dL	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	225	225
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.4**	**1.9**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.3	5.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.0%**	**0.9%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Table 2.62
Predicted Blood-Lead Concentrations
Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children
OD Hill MRS, Seneca Army Depot

	Surface Soil EPC (mg/kg)	Groundwater EPC (µg/L)	Surface Water EPC (µg/L)	Predicted Blood-Lead Concentration [(1)] (µg/dL)	Predicted Percentage of Children with Blood-Lead Concentration Greater than 10 µg/dL	Is the predicted blood-lead concentration greater than the blood-lead level of concern of 10 µg/dL or predicted percentage greater than 5% [(2)]? (Y/N)
Future Resident - MW1	169	0.71 J	68.7	3.1	0.14%	N
Future Resident - MW2	169	0.66 J	68.7	3.1	0.14%	N
Future Resident - MW3	169	0.73 J	68.7	3.1	0.14%	N
Future Resident - MW4	169	15.7	68.7	5.6	3.7%	N
Future Resident - MW5	169	1.1 J	68.7	3.2	0.16%	N
Future Resident - MW45-2	169	0.71 J	68.7	3.1	0.14%	N
Future Resident - MW45-3	169	9.5	68.7	4.5	1.4%	N
Future Resident - MW45-4	169	75.6	68.7	13	54%	**Y**
Future Resident - MW23-4	169	5.4	68.7	3.8	0.59%	N
Future Resident - MW23-5	169	2.4 J	68.7	3.4	0.25%	N
Future Resident - MW23-6	169	3.6 J	68.7	3.6	0.36%	N

(1) The highest predicted blood lead concentration for all child age groups reported. See Appendix Cfor supporting output.
(2) EPA (2007) Intergrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children.

Table 2.63
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Hypothetical Future Resident
Kickout Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Phenanthrene	0.018	--	--	--	**--**	--	--	--	--	--	**--**	**--**
Herbicides												
MCPA	9.4	--	--	--	**--**	0.24	0.023	0.065	0.010	--	**0.3**	**0.03**
Metals												
Aluminum	18000	--	--	--	**--**	0.23	0.022	--	--	0.0026	**0.2**	**0.02**
Arsenic	6.3	5.5E-07	--	7.3E-09	**5.6E-07**	0.27	0.025	0.022	0.0032	0.00031	**0.3**	**0.03**
Cadmium	2.6	--	--	1.3E-09	**1.3E-09**	0.033	0.0031	0.0036	0.00053	0.00019	**0.0**	**0.00**
Cobalt	44	--	--	1.1E-07	**1.1E-07**	1.88	0.176	--	--	0.0053	**1.9**	**0.18**
Manganese	1700	--	--	--	**--**	0.16	0.015	--	--	0.025	**0.2**	**0.04**
Vanadium	33	--		--		0.084	0.008	--	--	0.0002	**0.1**	**0.01**
	Pathway Risk	**5.5E-07**	**0.0E+00**	**1.2E-07**		**2.9**	**0.27**	**0.090**	**0.013**	**0.033**		
				Total Risk	**6.7E-07**						**3.0**	**0.32**
Chromium [2]												
Chromium (III)	29	--	--	--	**--**	0.00024	0.000023	--	--	--	**0.00024**	**0.000023**
Chromium (VI)	29	2.0E-05	--	6.5E-07	**2.1E-05**	0.12	0.011	--	--	0.0002	**0.12**	**0.012**
Pathway Risk (including Chromium (III))		**5.5E-07**	**0.0E+00**	**1.2E-07**	**--**	**2.9**	**0.27**	**0.090**	**0.013**	**0.033**	**3.0**	**0.32**
				Total Risk (including Chromium(III))	**6.7E-07**					**Total Hazard (including Chromium(III))**	**3.0**	**0.32**
Pathway Risk (including Chromium (VI))		**2.1E-05**	**0.0E+00**	**7.6E-07**	**--**	**3.0**	**0.28**	**0.090**	**0.013**	**0.034**	**--**	**--**
				Total Risk (including Chromium(VI))	**2.2E-05**					**Total Hazard (including Chromium(VI))**	**3.1**	**0.33**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.
[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.64
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Hypothetical Future Excavation/Construction Worker
Kickout Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
Phenanthrene	0.018	--	--	--	**--**	--	--	--	**--**
Herbicides									
MCPA	9.4	--	--	--	**--**	0.0019	0.00080	--	**0.003**
Metals									
Aluminum	18000	--	--	--	**--**	0.0018	--	0.00007	**0.002**
Arsenic	6.3	1.4E-08	1.73E-09	8.0E-12	**2E-08**	0.0022	0.00027	0.000009	**0.0024**
Cadmium	2.6	--	--	1.4E-12	**1E-12**	0.00027	0.000045	0.000005	**0.000319**
Cobalt	44	--	--	1.2E-10	**1E-10**	0.015	--	0.000152	**0.015**
Manganese	1700	--	--	--	**--**	0.0012	--	0.0007	**0.0020**
Vanadium	33	--	--	--	**--**	0.00067	--	0.000007	
	Pathway Risk	**1.4E-08**	**1.7E-09**	**1.3E-10**	**1.6E-08**	**0.023**	**0.0011**	**0.0010**	**0.025**
				Total Risk	**1.6E-08**			**Hazard Index**	**0.025**
Chromium [2]									
Chromium (III)	29	--	--	--	**--**	0.0000020	--	--	**0.0000020**
Chromium (VI)	29	2.1E-08	--	7.1E-10	**2E-08**	0.0010	--	0.0000059	**0.0010**
Pathway Risk (including Chromium (III))		**1E-08**	**2E-09**	**1E-10**	**--**	**0.023**	**0.001**	**0.001**	**--**
				Total Risk (including Chromium(III))	**2E-08**			**Total Hazard (including Chromium(III))**	**0.025**
Pathway Risk (including Chromium (VI))		**3E-08**	**2E-09**	**8E-10**	**--**	**0.024**	**0.001**	**0.001**	**--**
				Total Risk (including Chromium(VI))	**4E-08**			**Total Hazard (including Chromium(VI))**	**0.026**

(1) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.65
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Future Park Worker
Kickout Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Semivolatile Organic Compounds									
Phenanthrene	0.018	--	--	--	**--**	--	--	--	**--**
Herbicides					**--**				
MCPA	9.4	--	--	--	**--**	0.014	0.0060	--	**0.021**
Metals					**--**				
Aluminum	18000	--	--	--	**--**	0.014	--	0.00056	**0.014**
Arsenic	6.3	2.6E-06	3.2E-07	2E-09	**3E-06**	0.016	0.0020	0.000066	**0.018**
Cadmium	2.6	--	--	3E-10	**3E-10**	0.0020	0.00034	0.000041	**0.002**
Cobalt	44		--	--	**--**	0.11	--	0.0011	**0.114**
Manganese	1700	--	--	--	**--**	0.0094	--	0.0053	**0.0147**
Vanadium	33	--	--	--	**--**	0.0050	--	0.000051	**0.0051**
	Pathway Risk	**2.6E-06**	**3.2E-07**	**1.8E-09**		**0.17**	**0.0084**	**0.0072**	
				Total Risk	**2.9E-06**			**Hazard Index**	**0.19**
Chromium [2]									
Chromium (III)	29	--	--	--	**--**	0.000015	--	--	**0.000015**
Chromium (VI)	29	3.9E-06	--	1.3E-07	**4E-06**	0.01	--	0.000044	**0.0074**
Pathway Risk (including Chromium (III))		**3E-06**	**3E-07**	**2E-09**	**--**	**0.174**	**0.008**	**0.007**	**--**
				Total Risk (including Chromium(III))	**2.9E-06**			**Total Hazard (including Chromium(III))**	**0.19**
Pathway Risk (including Chromium (VI))		**7E-06**	**3E-07**	**1E-07**	**--**	**0.181**	**0.008**	**0.007**	**--**
				Total Risk (including Chromium(VI))	**7.0E-06**			**Total Hazard (including Chromium(VI))**	**0.20**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.66
Human Health Risk Evaluation Summary
Surface Soil (0 - ≤ 2 feet bgs)
Current and Future Recreational User
Kickout Area - Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (mg/kg)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Semivolatile Organic Compounds												
Phenanthrene	0.018	--	--	--	**--**	--	--	--	--	--	**--**	**--**
Herbicides												
MCPA	9.4	--	--	--	**--**	0.016	0.0015	0.0044	0.00065	--	**0.021**	**0.0022**
Metals												
Aluminum	18000	--	--	--	**--**	0.016	0.0015	--	--	0.00018	**0.016**	**0.0017**
Arsenic	6.3	9.3E-07	8.5E-08	5E-10	**1E-06**	0.018	0.0017	0.0015	0.00022	0.000021	**0.020**	**0.0020**
Cadmium	2.6	--	--	9E-11	**9E-11**	0.0023	0.00021	0.00025	0.000036	0.000013	**0.0026**	**0.00026**
Cobalt	44	--	--	--	**--**	0.13	0.012	--	--	0.00037	**0.13**	**0.012**
Manganese	1700	--	--	--	**--**	0.011	0.0010	--	--	0.0017	**0.012**	**0.0027**
Vanadium	33	--	--	--		0.0057	0.00054	--	--	0.000016	**0.0058**	**0.00055**
	Pathway Risk	**9.3E-07**	**8.5E-08**	**5.9E-10**		**0.20**	**0.019**	**0.0062**	**0.00091**	**0.0023**		
				Total Risk	**1.0E-06**						**0.21**	**0.022**
Chromium [2]												
Chromium (III)	29	--	--	--	**--**	0.000017	0.0000016	--	--	--	**0.000017**	**0.0000016**
Chromium (VI)	29	1.4E-06	--	4E-08	**1.4E-06**	0.0083	0.00078	--	--	0.000014	**0.0083**	**0.00080**
Pathway Risk (including Chromium (III))		9E-07	9E-08	6E-10	**--**	0.20	0.019	0.0062	0.00091	0.0023	**0.21**	**0.022**
				Total Risk (including Chromium(III))	**1.0E-06**					**Total Hazard (including Chromium(III))**	**0.000017**	**0.0000016**
Pathway Risk (including Chromium (VI))		2E-06	9E-08	5E-08	**--**	0.21	0.019	0.0062	0.00091	0.0023	**--**	**--**
				Total Risk (including Chromium(VI))	**2.5E-06**					**Total Hazard (including Chromium(VI))**	**0.0083**	**0.00080**

[1] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

[2] TChromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.67
Human Health Risk Evaluation
Hypothetical Future Resident
Surface Water, Upstream of OD Area
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Volatile Organic Compounds												
1,2-Dichloroethane	5 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Explosives												
RDX	0.12 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Metals												
Aluminum	140	--	--	NC	**--**	0.000089	0.000017	0.000024	0.000010	NC	**0.00011**	**0.000027**
Arsenic	3.6 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	48.3		--	NC	**--**	0.00015	0.000029	0.00059	0.00025	NC	**0.00075**	**0.00028**
Cadmium	0.88	--	--	NC	**--**	0.0011	0.00021	0.0061	0.0025	NC	**0.0072**	**0.0028**
Cobalt	1.70 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	3	--	--	NC	**--**	0.000048	0.0000090	0.000013	0.0000054	NC	**0.000061**	**0.000014**
Cyanide	10		--	NC	**--**	0.011	0.0020	0.0029	0.0012	NC	**0.014**	**0.0032**
Manganese	69.4	--	--	NC	**--**	0.0018	0.00035	0.012	0.0052	NC	**0.014**	**0.0056**
Mercury	0.10 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Nickel	15.9 U		--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	39.2	--	--	NC	**--**	0.0050	0.00094	0.051	0.022	NC	**0.056**	**0.023**
Zinc	14.3	--	--	NC	**--**	0.000030	0.0000057	0.0000049	0.0000021	NC	**0.000035**	**0.0000078**
		--	**--**	**NC**	**--**	**0.019**	**0.0036**	**0.073**	**0.031**	**NC**	**0.092**	**0.034**
				Total Risk	**0.0E+00**					**Hazard Index**	**0.092**	**0.034**
Chromium [2]												
Chromium (III)	6.1 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	6.1 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	**--**	**0.019**	**0.0036**	**0.073**	**0.031**	NC	**0.092**	**0.034**
				Total Risk (including Chromium(III))	**0.0E+00**					**Total Hazard (including Chromium(III))**	**0.092**	**0.034**
Pathway Risk (including Chromium (VI))		**0.0E+00**	**0.0E+00**	NC	**--**	**0.019**	**0.0036**	**0.073**	**0.031**	NC	**0.092**	**0.034**
				Total Risk (including Chromium(VI))	**0.0E+00**					**Total Hazard (including Chromium(VI))**	**0.092**	**0.034**

(1) Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.68
Human Health Risk Evaluation
Hypothetical Future Excavation/Construction Worker
Surface Water, Upstream of OD Area
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Volatile Organic Compounds									
1,2-Dichloroethane	5 U	--	--	NC	**--**	--	--	NC	**--**
Explosives									
RDX	0.12 U	--	--	NC	**--**	--	--	NC	**--**
Metals									
Aluminum	140	--	--	NC	**--**	0.0000029	0.0000020	NC	**0.0000049**
Arsenic	3.6 U	--	--	NC	**--**	--	--	NC	**--**
Barium	48.3		--	NC	**--**	0.0000050	0.000040	NC	**0.000045**
Cadmium	0.88	--	--	NC	**--**	0.000036	0.00036	NC	**0.00040**
Cobalt	1.70 U	--	--	NC	**--**	--	--	NC	**--**
Copper	3	--	--	NC	**--**	0.0000015	0.00000066	NC	**0.0000022**
Cyanide	10		--	NC	**--**	0.00034	0.00014	NC	**0.00048**
Manganese	69.4	--	--	NC	**--**	0.000059	0.00062	NC	**0.00068**
Mercury	0.10 U	--	--	NC	**--**	--	--	NC	**--**
Nickel	15.9 U		--	NC	**--**	--	--	NC	**--**
Vanadium	39.2	--	--	NC	**--**	0.00016	0.0026	NC	**0.0027**
Zinc	14.3	--	--	NC	**--**	0.0000010	0.00000025	NC	**0.0000012**
		--	**--**	**NC**	**--**	**0.00061**	**0.0037**	**NC**	**0.0043**
				Total Risk	**0.0E+00**			**Hazard Index**	**0.0043**
Chromium [2]									
Chromium (III)	6.1 U	--	--	NC	**--**	0.0000058	0.000039	NC	**0.000045**
Chromium (VI)	6.1 U	--	--	NC	**--**	0.0029	0.020	NC	**0.023**
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	**--**	**0.00061**	**0.0038**	NC	**0.0044**
				Total Risk (including Chromium(III))	**0.0E+00**			**Total Hazard (including Chromium(III))**	**0.0044**
Pathway Risk (including Chromium (VI))		**0.0E+00**	**0.0E+00**	NC	**0.0E+00**	**0.0035**	**0.024**	NC	**0.027**
				Total Risk (including Chromium(VI))	**0.0E+00**			**Total Hazard (including Chromium(VI))**	**0.027**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.69
Human Health Risk Evaluation
Future Park Worker
Surface Water, Upstream of OD Area
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Volatile Organic Compounds									
1,2-Dichloroethane	5 U	--	--	NC	**--**	--	--	NC	**--**
Explosives									
RDX	0.12 U	--	--	NC	**--**	--	--	NC	**--**
Metals									
Aluminum	140	--	--	NC	**--**	0.000011	0.00000015	NC	**0.000011**
Arsenic	3.6 U	--	--	NC	**--**	--	--	NC	**--**
Barium	48.3	--	--	NC	**--**	0.000019	0.0000037	NC	**0.000022**
Cadmium	0.88	--	--	NC	**--**	0.00014	0.000038	NC	**0.00017**
Cobalt	1.70 U	--	--	NC	**--**	--	--	NC	**--**
Copper	3	--	--	NC	**--**	0.0000058	0.000000081	NC	**0.0000059**
Cyanide	10	--	--	NC	**--**	0.0013	0.000018	NC	**0.0013**
Manganese	69.4	--	--	NC	**--**	0.00022	0.000078	NC	**0.00030**
Mercury	0.10 U	--	--	NC	**--**	--	--	NC	**--**
Nickel	15.9 U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	39.2	--	--	NC	**--**	0.00061	0.00032	NC	**0.00093**
Zinc	14.3	--	--	NC	**--**	0.0000037	0.000000031	NC	**0.0000037**
		--	**--**	**NC**	**--**	**0.0023**	**0.00046**	**NC**	**0.00275**
				Total Risk	**0.0E+00**			**Hazard Index**	**0.0028**
Chromium [2]									
Chromium (III)	6.1 U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	6.1 U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	**--**	**0.0023**	**0.00046**	NC	**0.0028**
				Total Risk (including Chromium(III))	**0.0E+00**			**Total Hazard (including Chromium(III))**	**0.0028**
Pathway Risk (including Chromium (VI))		**0.0E+00**	**0.0E+00**	NC	**--**	**0.0023**	**0.00046**	NC	**0.0028**
				Total Risk (including Chromium(VI))	**0.0E+00**			**Total Hazard (including Chromium(VI))**	**0.0028**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.70
Human Health Risk Evaluation
Current and Future Recreational User
Surface Water, Upstream of OD Area
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Volatile Organic												
1,2-Dichloroethane	5 U	--	--	NC	--	--	--	--	--	NC	--	--
Explosives												
RDX	0.12 U	--	--	NC	--	--	--	--	--	NC	--	--
Metals												
Aluminum	140	--	--	NC	--	0.000012	0.0000023	0.0000033	0.0000014	NC	**0.000016**	**0.0000037**
Arsenic	3.6 U	--	--	NC	--	--	--	--	--	NC	--	--
Barium	48.3	--	--	NC	--	0.000021	0.0000040	0.000081	0.000034	NC	**0.00010**	**0.000038**
Cadmium	0.88	--	--	NC	--	0.00015	0.000029	0.00083	0.00035	NC	**0.0010**	**0.00038**
Cobalt	1.70 U	--	--	NC	--	--	--	--	--	NC	--	--
Copper	3	--	--	NC	--	0.0000066	0.0000012	0.0000018	0.00000074	NC	**0.0000083**	**0.0000020**
Cyanide	10	--	--	NC	--	0.0015	0.00027	0.00039	0.00017	NC	**0.0019**	**0.00044**
Manganese	69.4	--	--	NC	--	0.00025	0.000048	0.0017	0.00072	NC	**0.0020**	**0.00076**
Mercury	0.10 U	--	--	NC	--	--	--	--	--	NC	--	--
Nickel	15.9 U	--	--	NC	--	--	--	--	--	NC	--	--
Vanadium	39.2	--	--	NC	--	0.00069	0.00013	0.0071	0.0030	NC	**0.0077**	**0.0031**
Zinc	14.3	--	--	NC	--	0.0000042	0.00000078	0.00000067	0.00000028	NC	**0.0000049**	**0.0000011**
		--	**--**	**NC**	**--**	**0.0026**	**0.00049**	**0.010**	**0.0042**	**NC**	**0.013**	**0.0047**
				Total Risk	**0.0E+00**					**Hazard Index**	**0.013**	**0.0047**
Chromium [2]												
Chromium (III)	6.1 U	--	--	NC	--	--	--	--	--	NC	--	--
Chromium (VI)	6.1 U	--	--	NC	--	--	--	--	--	NC	--	--
Pathway Risk (including Chromium (III))		**0.0E+00**	**0.0E+00**	NC	--	**0.0026**	**0.00049**	**0.010**	**0.0042**	NC	**0.013**	**0.0047**
				Total Risk (including Chromium(III))	**0.0E+00**					**Total Hazard (including Chromium(III))**	**0.013**	**0.0047**
Pathway Risk (including Chromium (VI))		**0.0E+00**	**0.0E+00**	NC	--	**0.0026**	**0.00049**	**0.010**	**0.0042**	NC		
				Total Risk (including Chromium(VI))	**0.0E+00**					**Total Hazard (including Chromium(VI))**	**0.013**	**0.0047**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.71
Human Health Risk Evaluation
Hypothetical Future Resident
Surface Water, Drainage Ditch
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Volatile Organic Compounds												
1,2-Dichloroethane	10 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Explosives												
RDX	2	2.0E-08	6.9E-09	NC	**2.7E-08**	0.00043	0.000080	0.0001	0.000043	NC	**0.0**	**0.0**
Metals												
Aluminum	37,500	--	--	NC	**--**	0.02397	0.004495	0.0064	0.0027	NC	**0.03042**	**0.007206**
Arsenic	2.3 J	3.1E-07	1.2E-07	NC	**4.3E-07**	0.00490	0.000919	0.0013	0.00055	NC	**0.0**	**0.00**
Barium	439	--	--	NC	**--**	0.00140	0.000263	0.0054	0.0023	NC	**0.00680**	**0.00253**
Cadmium	11.2	--	--	NC	**--**	0.01432	0.002685	0.077	0.032	NC	**0.0914**	**0.0351**
Cobalt	18.2	--	--	NC	**--**	0.03878	0.007272	0.0042	0.0018	NC	**0.04**	**0.01**
Copper	612	--	--	NC	**--**	0.00978	0.001834	0.0026	0.0011	NC	**0.012412**	**0.002940**
Cyanide	47.7	--	--	NC	**--**	0.05082	0.009529	0.014	0.0057	NC	**0.064**	**0.0153**
Manganese	1,250	--	--	NC	**--**	0.03330	0.006243	0.22	0.094	NC	**0.257**	**0.1004**
Mercury	3.0	--	--	NC	**--**	0.00639	0.001199	0.025	0.010	NC	**0.031**	**0.012**
Nickel	74.2	--	--	NC	**--**	0.00237	0.000445	0.0032	0.0013	NC	**0.01**	**0.00**
Vanadium	54.9	--	--	NC	**--**	0.00702	0.001316	0.1	0.0	NC	**0.079**	**0.032**
Zinc	883	--	--	NC	**--**	0.00188	0.000353	0.00030	0.00013	NC	**0.002185**	**0.0004805**
		3.3E-07	**1.3E-07**	**NC**	**4.6E-07**	**0.195**	**0.0366**	**0.435**	**0.183**	**NC**	**0.630**	**0.219**
				Total Risk	**4.6E-07**					**Hazard Index**	**0.630**	**0.219**
Chromium [2]												
Chromium (III)	50.8	--	--	NC	**--**	0.00002	0.000004	0.00045	0.000	NC	**0.0005**	**0.0002**
Chromium (VI)	50.8	2.3E-06	7.2E-05	NC	**7.4E-05**	0.01082	0.002030	0.23	0.10	NC	**0.2**	**0.1**
Pathway Risk (including Chromium (III))		**3.3E-07**	**1.3E-07**	NC	**4.6E-07**	**0.195**	**0.0366**	**0.435**	**0.183**	NC	**0.631**	**0.220**
				Total Risk (including Chromium(III))	**4.6E-07**					**Total Hazard (including Chromium(III))**	**0.631**	**0.220**
Pathway Risk (including Chromium (VI))		**2.6E-06**	**1.3E-07**	NC	**2.7E-06**	**0.206**	**0.0387**	**0.668**	**0.281**	NC	**0.874**	**0.319**
				Total Risk (including Chromium(VI))	**7.5E-05**					**Total Hazard (including Chromium(VI))**	**0.874**	**0.319**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.72
Human Health Risk Evaluation
Hypothetical Future Excavation/Construction Worker
Surface Water, Drainage Ditch
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [(1)] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Volatile Organic Compounds									
1,2-Dichloroethane	10 U	--	--	NC	**--**	--	--	NC	**--**
Explosives									
RDX	2	6.5E-11	2.0E-11	NC	**8.5E-11**	0.000014	0.000004	NC	**0.0000**
Metals									
Aluminum	37,500	--	--	NC	**--**	0.00077	0.00054	NC	**0.0013098**
Arsenic	2.3 J	1.0E-09	4.5E-10	NC	**1.5E-09**	0.00016	0.000070	NC	**0.00023**
Barium	439		--	NC	**--**	0.00005	0.00036	NC	**0.000406**
Cadmium	11.2	--	--	NC	**--**	0.00046	0.0046	NC	**0.00508**
Cobalt	18.2	--	--	NC	**--**	0.00125	0.00021	NC	**0.001**
Copper	612	--	--	NC	**--**	0.00031	0.00013	NC	**0.0004493**
Cyanide	47.7		--	NC	**--**	0.00163	0.00065	NC	**0.00228**
Manganese	1,250	--	--	NC	**--**	0.0011	0.011	NC	**0.01232**
Mercury	3.0	--	--	NC	**--**	0.00021	0.0037	NC	**0.0039**
Nickel	74.2		--	NC	**--**	0.00008	0.00016	NC	**0.000**
Vanadium	54.9	--	--	NC	**--**	0.000	0.00	NC	**0.0038**
Zinc	883	--	--	NC	**--**	0.000060	0.000016	NC	**0.0000761**
		1.1E-09	**4.7E-10**	**NC**	**1.5E-09**	**0.00622**	**0.0253**	**NC**	**0.0315**
				Total Risk	**1.5E-09**			**Hazard Index**	**0.0315**
Chromium [(2)]									
Chromium (III)	50.8	--	--	NC	**--**	0.00000070	0.000022	NC	**0.000023**
Chromium (VI)	50.8	7.5E-09	2.5E-07	NC	**2.6E-07**	0.00035	0.012	NC	**0.012**
Pathway Risk (including Chromium (III))		**1.1E-09**	**4.7E-10**	NC	**1.5E-09**	**0.00622**	**0.0253**	NC	**0.0315**
				Total Risk (including Chromium(III))	**1.5E-09**			**Total Hazard (including Chromium(III))**	**0.0315**
Pathway Risk (including Chromium (VI))		**8.5E-09**	**2.5E-07**	NC	**2.6E-07**	**0.0066**	**0.037**	NC	**0.043**
				Total Risk (including Chromium(VI))	**2.6E-07**			**Total Hazard (including Chromium(VI))**	**0.043**

(1) Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.73
Human Health Risk Evaluation
Future Park Worker
Surface Water, Drainage Ditch
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [(1)] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Volatile Organic Compounds									
1,2-Dichloroethane	10 U	--	--	NC	**--**	--	--	NC	**--**
Explosives									
RDX	2	6.1E-09	7.5E-11	NC	**6.2E-09**	0.000052	0.00000064	NC	**0.000052**
Metals									
Aluminum	37,500	--	--	NC	**--**	0.0029	0.000040	NC	**0.002943**
Arsenic	2.3 J	9.5E-08	1.3E-09	NC	**9.7E-08**	0.00059	0.0000082	NC	**0.001**
Barium	439	--	--	NC	**--**	0.00017	0.000034	NC	**0.000204**
Cadmium	11.2	--	--	NC	**--**	0.0017	0.00048	NC	**0.00221**
Cobalt	18.2	--	--	NC	**--**	0.0047	0.000026	NC	**0.0**
Copper	612	--	--	NC	**--**	0.0012	0.000016	NC	**0.0012006**
Cyanide	47.7	--	--	NC	**--**	0.0062	0.000085	NC	**0.0062**
Manganese	1,250		--	NC	**--**	0.0040	0.0014	NC	**0.00543**
Mercury	3.0	--	--	NC	**--**	0.00077	0.00015	NC	**0.00**
Nickel	74.2	--	--	NC	**--**	0.00029	0.000020	NC	**0.0**
Vanadium	54.9		--	NC	**--**	0.001	0.000	NC	**0.00130**
Zinc	883	--	--	NC	**--**	0.00023	0.0000019	NC	**0.0002297**
		1.0E-07	**1.4E-09**	**NC**	**1.0E-07**	**0.0234**	**0.00271**	**NC**	**0.02614**
				Total Risk	**1.0E-07**			**Hazard Index**	**0.0261**
Chromium [(2)]									
Chromium (III)	50.8	--	--	NC	**--**	0.0000026	0.0000028	NC	**0.0000**
Chromium (VI)	50.8	7.0E-07	7.8E-07	NC	**1.5E-06**	0.001	0.0015	NC	**0.00**
Pathway Risk (including Chromium (III))		**1.0E-07**	**1.4E-09**	NC	**1.0E-07**	**0.0234**	**0.00272**	NC	**0.0261**
				Total Risk (including Chromium(III))	**1.0E-07**			**Total Hazard (including Chromium(III))**	**0.0261**
Pathway Risk (including Chromium (VI))		**8.0E-07**	**1.4E-09**	NC	**8.0E-07**	**0.0247**	**0.00417**	NC	**0.0289**
				Total Risk (including Chromium(VI))	**1.6E-06**			**Total Hazard (including Chromium(VI))**	**0.0289**

[(1)] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[(2)] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.74
Human Health Risk Evaluation
Current and Future Recreational User
Surface Water, Drainage Ditch
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Volatile Organic												
1,2-Dichloroethane	10 U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Explosives												
RDX	2	2.7E-09	9.5E-10	NC	**3.6E-09**	0.00006	0.0000	0.000014	0.0000059	NC	**0.00**	**0.00**
Metals												
Aluminum	37,500	--	--	NC	**--**	0.0033	0.0006	0.00088	0.00037	NC	**0.004172**	**0.0009883**
Arsenic	2.3 J	4.2E-08	1.7E-08	NC	**5.9E-08**	0.00067	0.0001	0.00018	0.00008	NC	**0.001**	**0.0002**
Barium	439	--	--	NC	**--**	0.00019	0.0000	0.0007	0.00031	NC	**0.00093**	**0.000347**
Cadmium	11.2	--	--	NC	**--**	0.0020	0.0004	0.011	0.0044	NC	**0.0125**	**0.00481**
Cobalt	18.2	--	--	NC	**--**	0.0053	0.0010	0.00057	0.00024	NC	**0.006**	**0.0012**
Copper	612	--	--	NC	**--**	0.0013	0.0003	0.00036	0.00015	NC	**0.0017022**	**0.0004032**
Cyanide	47.7	--	--	NC	**--**	0.0070	0.0013	0.0019	0.00079	NC	**0.0088**	**0.00210**
Manganese	1,250	--	--	NC	**--**	0.0046	0.0009	0.031	0.013	NC	**0.0353**	**0.01377**
Mercury	3.0	--	--	NC	**--**	0.00088	0.0002	0.003	0.0014	NC	**0.004**	**0.002**
Nickel	74.2	--	--	NC	**--**	0.00033	0.0001	0.00044	0.00018	NC	**0.001**	**0.0002**
Vanadium	54.9	--	--	NC	**--**	0.00	0.0002	0.010	0.00	NC	**0.0108**	**0.0043**
Zinc	883	--	--	NC	**--**	0.00026	0.0000	0.000042	0.000018	NC	**0.0002997**	**0.0000659**
		4.5E-08	**1.8E-08**	**NC**	**6.3E-08**	**0.0265**	**0.00498**	**0.060**	**0.0251**	**NC**	**0.086**	**0.0300**
				Total Risk	**6.3E-08**					**Hazard Index**	**0.086**	**0.0300**
Chromium [2]												
Chromium (III)	50.8	--	--	NC	**--**	0.0000030	0.00000056	0.000061	0.000026	NC	**0.000064**	**0.000026**
Chromium (VI)	50.8	3.1E-07	9.9E-06	NC	**1.0E-05**	0.0015	0.00028	0.032	0.013	NC	**0.0334**	**0.0137**
Pathway Risk (including Chromium (III))		**4.5E-08**	**1.8E-08**	NC	**6.3E-08**	**0.0265**	**0.00498**	**0.060**	**0.0251**	NC	**0.086**	**0.0301**
				Total Risk (including Chromium(III))	**6.3E-08**					**Total Hazard (including Chromium(III))**	**0.086**	**0.0301**
Pathway Risk (including Chromium (VI))		**3.5E-07**	**1.8E-08**	NC	**3.7E-07**	**0.0280**	**0.00525**	**0.092**	**0.0385**	NC		
				Total Risk (including Chromium(VI))	**1.0E-05**					**Total Hazard (including Chromium(VI))**	**0.120**	**0.0437**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.75
Human Health Risk Evaluation
Hypothetical Future Resident
Surface Water, Reeder Creek
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Volatile Organic Compounds													
1,2-Dichloroethane	2	J	1.6E-08	3.7E-08	NC	**5.3E-08**	0.00021	0.000040	0.00033	0.00014	NC	**0.001**	**0.000**
Explosives													
RDX	0.67		6.6E-09	2.3E-09	NC	**8.9E-09**	0.00014	0.000027	0.0000	0.000014	NC	**0.0**	**0.0**
Metals													
Aluminum	300		--	--	NC	**--**	0.00019	0.000036	0.0001	0.0000	NC	**0.00029**	**0.000036**
Arsenic	3.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	66.6	J	--	--	NC	**--**	0.00021	0.000040	0.0008	0.0003	NC	**0.00101**	**0.00034**
Cadmium	0.45	J	--	--	NC	**--**	0.00058	0.000108	0.003	0.001	NC	**0.0036**	**0.0011**
Cobalt	1.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	19.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cyanide	14.9		--	--	NC	**--**	0.01588	0.002977	0.004	0.0018	NC	**0.020**	**0.0048**
Manganese	236		--	--	NC	**--**	0.00629	0.001179	0.04	0.018	NC	**0.046**	**0.0192**
Mercury	0.11	J	--	--	NC	**--**	0.00023	0.000044	0.001	0.000	NC	**0.001**	**0.000**
Nickel	35.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	30.9	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Zinc	15.4	J	--	--	NC	**--**	0.00003	0.000006	0.00001	0.00000	NC	**0.000043**	**0.0000060**
			2.3E-08	**3.9E-08**	**NC**	**6.2E-08**	**0.024**	**0.0045**	**0.049**	**0.021**	**NC**	**0.073**	**0.026**
					Total Risk	**6.2E-08**					**Hazard Index**	**0.073**	**0.026**
Chromium [2]													
Chromium (III)	9.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	9.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))			**2.3E-08**	**3.9E-08**	NC	**6.2E-08**	**0.024**	**0.0045**	**0.049**	**0.021**	NC	**0.073**	**0.026**
					Total Risk (including Chromium(III))	**6.2E-08**					**Total Hazard (including Chromium(III))**	**0.073**	**0.026**
Pathway Risk (including Chromium (VI))			**2.3E-08**	**3.9E-08**	NC	**6.2E-08**	**0.024**	**0.0045**	**0.049**	**0.021**	NC	**0.073**	**0.026**
					Total Risk (including Chromium(VI))	**6.2E-08**					**Total Hazard (including Chromium(VI))**	**0.073**	**0.026**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.76
Human Health Risk Evaluation
Hypothetical Future Excavation/Construction Worker
Surface Water, Reeder Creek
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [(1)] (µg/L)	Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Volatile Organic Compounds									
1,2-Dichloroethane	2 J	8.7E-09	1.1E-10	NC	**8.8E-09**	0.0000068	0.000014	NC	**0.000021**
Explosives									
RDX	0.67	3.5E-09	6.7E-12	NC	**3.5E-09**	0.000005	0.000001	NC	**0.0000**
Metals									
Aluminum	300	--	--	NC	**--**	0.00001	0.00000	NC	**0.0000100**
Arsenic	3.6 U	--	--	NC	**--**	--	--	NC	**--**
Barium	66.6 J		--	NC	**--**	0.00001	0.00005	NC	**0.000060**
Cadmium	0.45 J	--	--	NC	**--**	0.00002	0.0002	NC	**0.00022**
Cobalt	1.7 U	--	--	NC	**--**	--	--	NC	**--**
Copper	19.7 U	--	--	NC	**--**	--	--	NC	**--**
Cyanide	14.9		--	NC	**--**	0.00051	0.00020	NC	**0.00071**
Manganese	236	--	--	NC	**--**	0.0002	0.002	NC	**0.00220**
Mercury	0.11 J	--	--	NC	**--**	0.00001	0.0001	NC	**0.0001**
Nickel	35.2 U		--	NC	**--**	--	--	NC	**--**
Vanadium	30.9 U	--	--	NC	**--**	--	--	NC	**--**
Zinc	15.4 J	--	--	NC	**--**	0.000001	0.000000	NC	**0.0000010**
		1.2E-08	**1.2E-10**	**NC**	**1.2E-08**	**0.00077**	**0.0026**	**NC**	**0.0033**
				Total Risk	**1.2E-08**			**Hazard Index**	**0.0033**
Chromium [(2)]									
Chromium (III)	9.6 U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	9.6 U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))		**1.2E-08**	**1.2E-10**	NC	**1.2E-08**	**0.00077**	**0.0026**	NC	**0.0033**
				Total Risk (including Chromium(III))	**1.2E-08**			**Total Hazard (including Chromium(III))**	**0.0033**
Pathway Risk (including Chromium (VI))		**1.2E-08**	**1.2E-10**	NC	**1.2E-08**	**0.0008**	**0.003**	NC	**0.003**
				Total Risk (including Chromium(VI))	**1.2E-08**			**Total Hazard (including Chromium(VI))**	**0.003**

(1) Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

(2) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).

-- Risk/hazard not calculated because toxicity value was not available.

Table 2.77
Human Health Risk Evaluation
Future Park Worker
Surface Water, Reeder Creek
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (μg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Total Hazard Quotient
Volatile Organic Compounds										
1,2-Dichloroethane	2	J	5.0E-09	4.0E-10	NC	**5.4E-09**	0.000026	0.0000021	NC	**0.000**
Explosives										
RDX	0.67		2.0E-09	2.5E-11	NC	**2.0E-09**	0.000017	0.00000021	NC	**0.000017**
Metals										
Aluminum	300		--	--	NC	**--**	0.0000	0.000000	NC	**--**
Arsenic	3.6	U	--	--	NC	**--**	--	--	NC	**--**
Barium	66.6	J	--	--	NC	**--**	0.00003	0.000005	NC	**0.000035**
Cadmium	0.45	J	--	--	NC	**--**	0.0001	0.00002	NC	**0.00012**
Cobalt	1.7	U	--	--	NC	**--**	--	--	NC	**--**
Copper	19.7	U	--	--	NC	**--**	--	--	NC	**--**
Cyanide	14.9		--	--	NC	**--**	0.0019	0.000027	NC	**0.0019**
Manganese	236		--	--	NC	**--**	0.0008	0.0003	NC	**0.00110**
Mercury	0.11	J	--	--	NC	**--**	0.00003	0.00001	NC	**0.00**
Nickel	35.2	U	--	--	NC	**--**	--	--	NC	**--**
Vanadium	30.9	U	--	--	NC	**--**	--	--	NC	**--**
Zinc	15.4	J	--	--	NC	**--**	0.00000	0.0000000	NC	**--**
			7.0E-09	**4.3E-10**	**NC**	**7.4E-09**	**0.0029**	**0.00036**	**NC**	**0.00327**
					Total Risk	**7.4E-09**			**Hazard Index**	**0.0033**
Chromium [2]										
Chromium (III)	9.6	U	--	--	NC	**--**	--	--	NC	**--**
Chromium (VI)	9.6	U	--	--	NC	**--**	--	--	NC	**--**
Pathway Risk (including Chromium (III))			**7.0E-09**	**4.3E-10**	NC	**7.4E-09**	**0.0029**	**0.00036**	NC	**0.0033**
					Total Risk (including Chromium(III))	**7.4E-09**			**Total Hazard (including Chromium(III))**	**0.0033**
Pathway Risk (including Chromium (VI))			**7.0E-09**	**4.3E-10**	NC	**7.4E-09**	**0.0029**	**0.00036**	NC	**0.0033**
					Total Risk (including Chromium(VI))	**7.4E-09**			**Total Hazard (including Chromium(VI))**	**0.0033**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.78
Human Health Risk Evaluation
Current and Future Recreational User
Surface Water, Reeder Creek
Seneca Army Depot Activity

Analyte	Exposure Point Concentration [1] (µg/L)		Ingestion Carcinogenic Risk	Dermal Carcinogenic Risk	Inhalation Carcinogenic Risk	Total Carcinogenic Risk	Ingestion Hazard Quotient - Child	Ingestion Hazard Quotient - Adult	Dermal Hazard Quotient - Child	Dermal Hazard Quotient - Adult	Inhalation Hazard Quotient	Total Hazard Quotient - Child	Total Hazard Quotient - Adult
Volatile Organic													
1,2-Dichloroethane	2	J	2.2E-09	5.1E-09	NC	**7.3E-09**	0.000029	0.000	0.000045	0.000019	NC	**0.0001**	**0.0000**
Explosives													
RDX	0.67		9.0E-10	3.2E-10	NC	**1.2E-09**	0.00002	0.0000	0.000005	0.0000020	NC	**0.00**	**0.00**
Metals													
Aluminum	300		--	--	NC	**--**	0.0000	0.0000	0.00001	0.00000	NC	**0.000010**	**--**
Arsenic	3.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Barium	66.6	J	--	--	NC	**--**	0.00003	0.0000	0.0001	0.00005	NC	**0.00013**	**0.000050**
Cadmium	0.45	J	--	--	NC	**--**	0.0001	0.0000	0.000	0.0002	NC	**0.0001**	**0.00020**
Cobalt	1.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Copper	19.7	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Cyanide	14.9		--	--	NC	**--**	0.0022	0.0000	0.0006	0.00025	NC	**0.0028**	**0.00025**
Manganese	236		--	--	NC	**--**	0.0009	0.0000	0.006	0.002	NC	**0.0069**	**0.00200**
Mercury	0.11	J	--	--	NC	**--**	0.00003	0.0000	0.000	0.0001	NC	**0.000**	**0.000**
Nickel	35.2	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Vanadium	30.9	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Zinc	15.4	J	--	--	NC	**--**	0.00000	0.0000	0.000001	0.000000	NC	**0.0000010**	**--**
			3.1E-09	**5.4E-09**	**NC**	**8.5E-09**	**0.0033**	**--**	**0.007**	**0.0026**	**NC**	**0.010**	**0.0026**
					Total Risk	**8.5E-09**					**Hazard Index**	**0.010**	**0.0026**
Chromium [2]													
Chromium (III)	9.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Chromium (VI)	9.6	U	--	--	NC	**--**	--	--	--	--	NC	**--**	**--**
Pathway Risk (including Chromium (III))			**3.1E-09**	**5.4E-09**	NC	**8.5E-09**	**0.0033**	**0.00000**	**0.007**	**0.0026**	NC	**0.010**	**0.0026**
					Total Risk (including Chromium(III))	**8.5E-09**					**Total Hazard (including Chromium(III))**	**0.010**	**0.0026**
Pathway Risk (including Chromium (VI))			**3.1E-09**	**5.4E-09**	NC	**8.5E-09**	**0.0033**	**0.00000**	**0.007**	**0.0026**	NC		
					Total Risk (including Chromium(VI))	**8.5E-09**					**Total Hazard (including Chromium(VI))**	**0.010**	**0.0026**

[1] Exposure point concentration is the maximum detected concentration from the surface water exposure area. See Table 2.13.

[2] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

NC = Exposure pathway is not calculated because volatile analytes not present.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
-- Risk/hazard not calculated because toxicity value was not available.

Table 2.79
Human Health Risk Evaluation
Summary of Risk and Hazard Associated with Expsoure to Surface Water
Seneca Army Depot Activity

All COPCs including chromium(III)

Exposure Area	Hypothetical Future Resident	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User	Hypothetical Future Resident (Child)	Hypothetical Future Resident (Adult)	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User (Child)	Current and Future Recreational User (Adult)
	Carcinogenic Risk				Noncarcinogenic Hazard Index					
Reeder Creek - Upstream	NC	NC	NC	NC	0.092	0.034	0.0044	0.0028	0.013	0.0047
On-Site Drainage Ditches	4.6E-07	1.5E-09	1.0E-07	6.3E-08	0.631	0.220	0.0315	0.0261	0.086	0.0301
Reeder Creek - Downstream	6.2E-08	1.2E-08	7.4E-09	8.5E-09	0.073	0.026	0.0033	0.0033	0.010	0.0026

All COPCs including chromium(VI)

Exposure Area	Hypothetical Future Resident	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User	Hypothetical Future Resident (Child)	Hypothetical Future Resident (Adult)	Hypothetical Excavation/ Construction Worker	Future Park Worker	Current and Future Recreational User (Child)	Current and Future Recreational User (Adult)
	Carcinogenic Risk				Noncarcinogenic Hazard Index					
Reeder Creek - Upstream	8.6E-06	NC	NC	2.5E-06	0.092	0.034	0.027	0.0028	0.021	0.0077
On-Site Drainage Ditches	7.5E-05	2.6E-07	1.6E-06	1.0E-05	0.874	0.319	0.043	0.0289	0.120	0.0437
Reeder Creek - Downstream	1.4E-05	1.2E-08	7.4E-09	8.5E-09	0.073	0.026	0.003	0.0033	0.010	0.0026

NC = not caluclated because no carcinogenic analytes detected

Table 2.80
Human Health Quantitative Cumulative Risk Summary for all Media
Seneca Army Depot Activity

All COPCs including chromium(III)

Receptor and Medium	Exposure Pathways	Total Carcinogenic Risk (1)	Total Hazard Index - Child (1)	Total Hazard Index - Adult (1)
Receptor: Hypothetical Future Resident				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	2.8E-05	**5.8**	0.60
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	5.8E-05	**6.4**	0.66
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	**1.8E-04**	**51**	**30**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	6.7E-07	**3.0**	0.32
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	4.6E-07	0.63	0.22
Receptor: Hypothetical Future Excavation/ Construction Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	8.2E-08	--	0.14
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	6.3E-08	--	0.055
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	1.9E-08	--	0.13
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	1.6E-08	--	0.025
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	1.5E-09	--	0.032
Receptor: Future Park Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	5.6E-06	--	0.37
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	9.8E-05	--	**19**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	2.9E-06	--	0.19
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	1.0E-07	--	0.026
Receptor: Current and Future Recreational User				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	1.8E-06	0.39	0.039
Groundwater - MW 45-4 (2)	Ingestion, Dermal Contact	1.3E-05	**3.4**	**2.0**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	1.0E-06	0.000017	0.0000016
Surface Water - On site drainage ditches (3)	Ingestion, Dermal Contact	6.3E-08	0.086	0.030

Table 2.80
Human Health Quantitative Cumulative Risk Summary for all Media
Seneca Army Depot Activity

All COPCs including chromium(VI)

Receptor and Medium	Exposure Pathways	Total Carcinogenic Risk [1]	Total Hazard Index - Child [1]	Total Hazard Index - Adult [1]
Receptor: Hypothetical Future Resident				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	6.5E-05	**6.0**	0.62
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	9.1E-05	**6.5**	0.67
Groundwater - MW 45-4 [2]	Ingestion, Dermal Contact	**1.2E-03**	**54**	**32**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	2.2E-05	**3.1**	0.33
Surface Water - On site drainage ditches [3]	Ingestion, Dermal Contact	7.5E-05	0.87	0.32
Receptor: Hypothetical Future Excavation/ Construction Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	2.1E-07	--	0.15
Combined Surface and Subsurface Soil (0 - ≤ 15 feet bgs)	Ingestion, Dermal Contact, Inhalation	9.7E-08	--	0.056
Groundwater - MW 45-4 [2]	Ingestion, Dermal Contact	5.1E-07	--	0.15
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	4E-08	--	0.026
Surface Water - On site drainage ditches [3]	Ingestion, Dermal Contact	2.6E-07	--	0.043
Receptor: Future Park Worker				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	1.3E-05	--	0.39
Groundwater - MW 45-4 [2]	Ingestion, Dermal Contact	**5.0E-04**	--	**20**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	7.0E-06	--	0.20
Surface Water - On site drainage ditches [3]	Ingestion, Dermal Contact	1.6E-06	--	0.0289
Receptor: Current and Future Recreational User				
Surface Soil (0 - ≤ 2 feet bgs) - OD Hill Area	Ingestion, Dermal Contact, Inhalation	4.4E-06	0.41	0.041
Groundwater - MW 45-4 [2]	Ingestion, Dermal Contact	6.3E-05	**3.6**	**2.1**
Surface Soil (0 - ≤ 2 feet bgs) - Kickout Area	Ingestion, Dermal Contact, Inhalation	2.5E-06	0.0083	0.00080
Surface Water - On site drainage ditches [3]	Ingestion, Dermal Contact	1.0E-05	0.120	0.0437

(1) Cancer Risks and Hazard Indices were calculated by summing across exposure routes for each receptor.

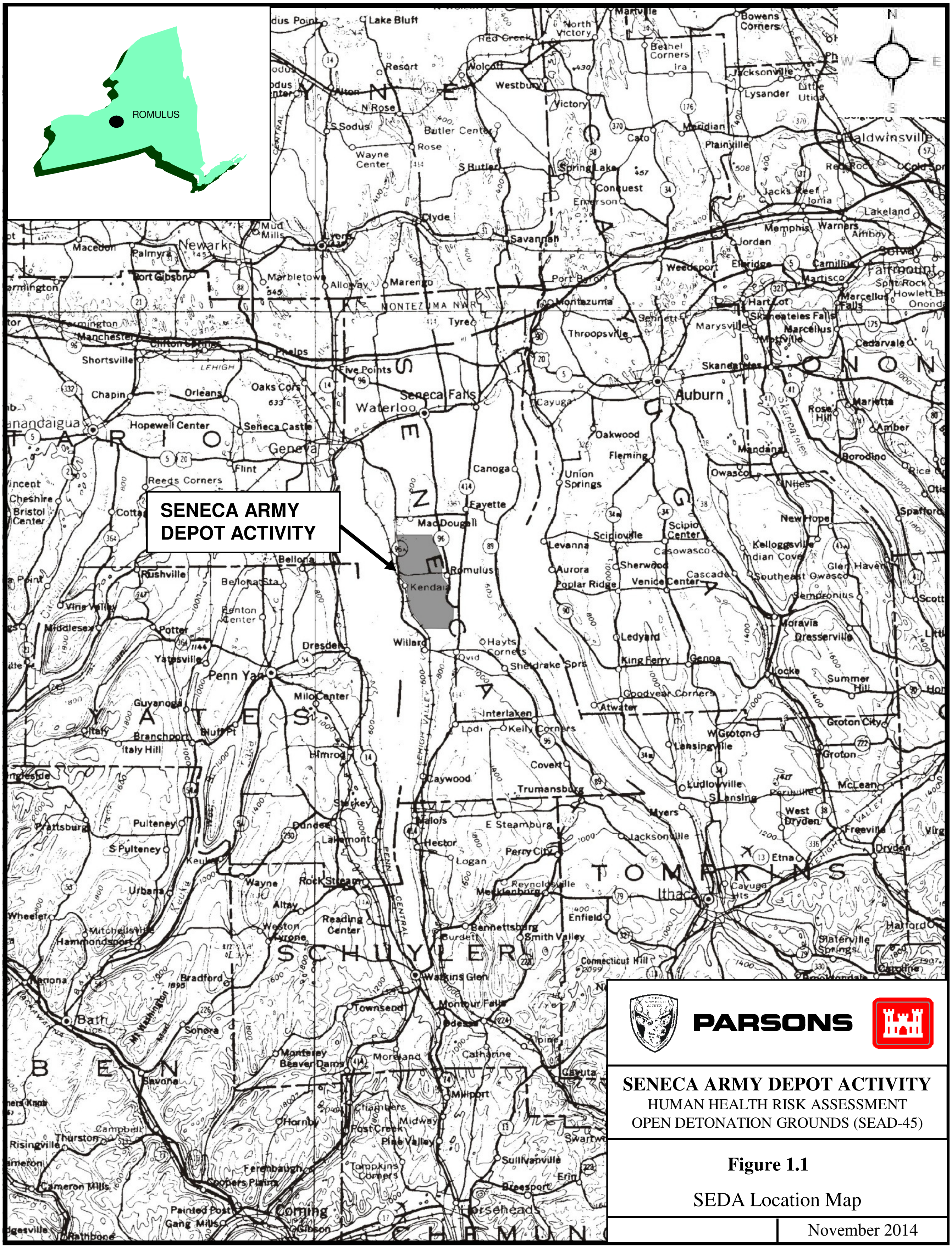
(2) The greatest risk associated with groundwater is from MW 45-4. For a summary of risk associated with individual wells, see Table 2.59.

(3) The surface water most likely to be encountered at the site is from the drainage ditches onsite. For a summary of risk associated with other surface water bodies, see Table 2.79.

-- = Cumulaive Hazard not calculated for a child for this receptor.

FIGURES

Section 1 Figures



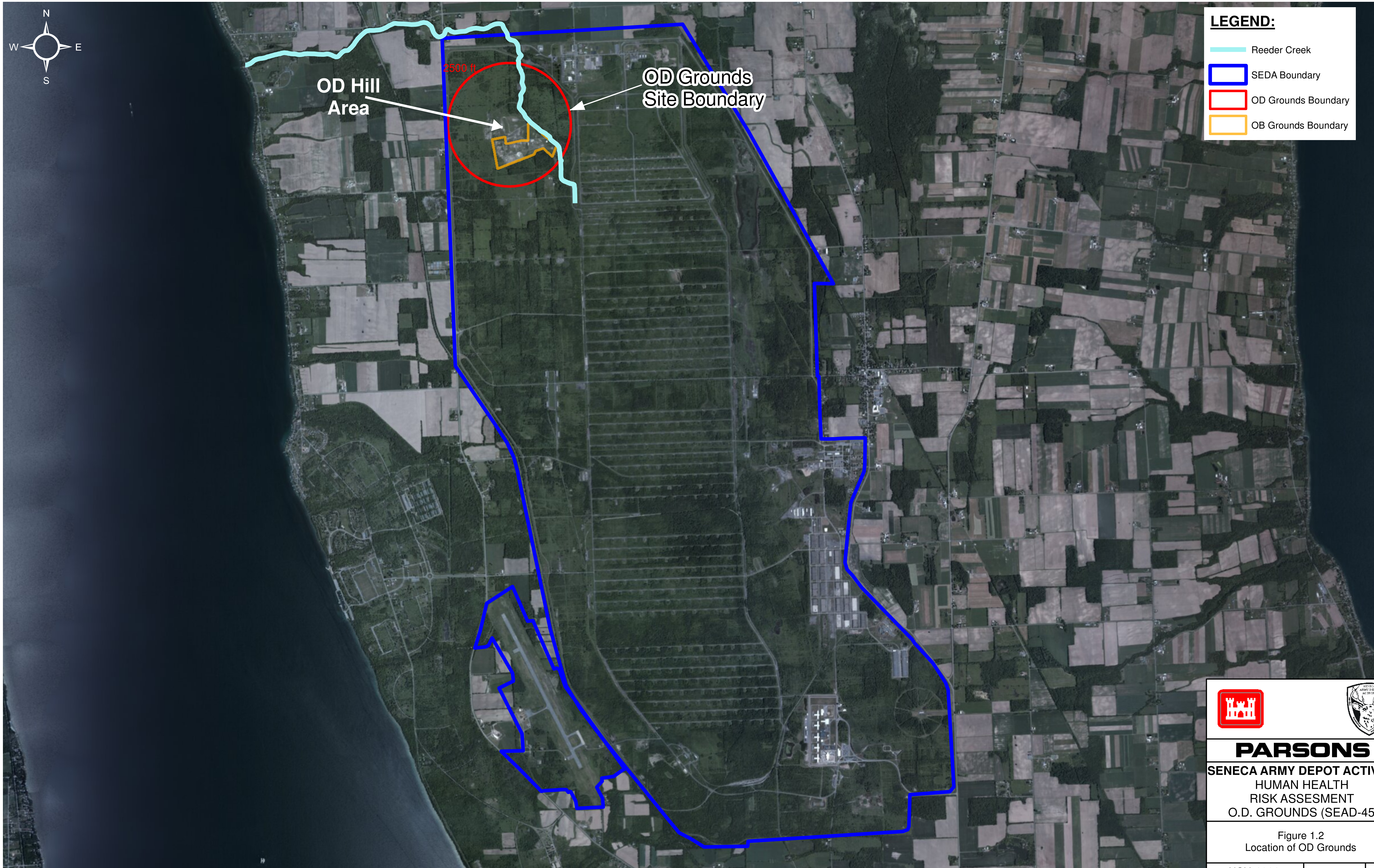
SENECA ARMY DEPOT ACTIVITY
HUMAN HEALTH RISK ASSESSMENT
OPEN DETONATION GROUNDS (SEAD-45)

Figure 1.1

SEDA Location Map

November 2014

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Figure B1-1 Loc Map.pptx



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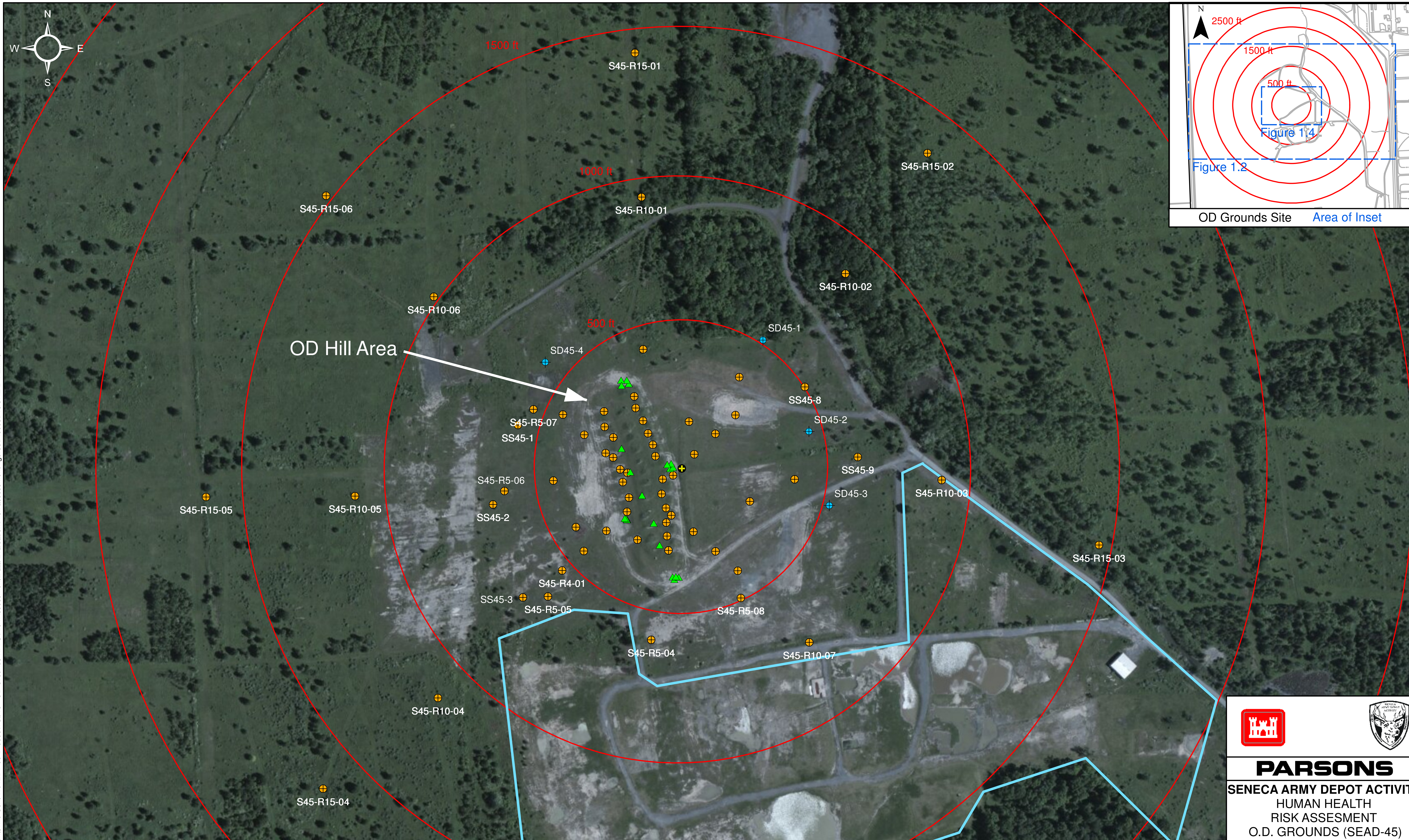
SENECA ARMY DEPOT ACTIVITY
HUMAN HEALTH
RISK ASSESMENT
O.D. GROUNDS (SEAD-45)

Figure 1.2
Location of OD Grounds

NOV. 2014	1 " = 3,500 '	TIB

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE 1-2.mxd



Legend

500 ft Radius Rings from OD Hill Distance from Center

Center Point of all Radius Rings (N 1012812, E 738375)

OB Grounds Boundary

Subsurface Soil Sample Location

Surface Soil Sample Location

Drainage Ditch Sample Location

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HUMAN HEALTH
RISK ASSESMENT
O.D. GROUNDS (SEAD-45)

Figure 1.3
OD Grounds Soil Sample Locations, Kickout Parcel

NOV. 2014	1 " = 300 '	BBO

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE B-1-2.mxd

Legend

500 ft Radius Rings from OD Hill Distance from Center

Center Point of all Radius Rings (N 1012812, E 738375)

OB Grounds Boundary

Subsurface Soil Sample Location

Surface Soil Sample Location

Drainage Ditch Sample Location

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RISK ASSESMENT
O.D. GROUNDS (SEAD-45)

Figure 1.4
OD Grounds Soil Sample Locations, OD Hill Parcel

NOV. 2014	1 " = 120 '	BBO

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE B-1-3.mxd

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE B-1-4.mxd

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SENECA ARMY DEPOT ACTIVITY
HUMAN HEALTH
RISK ASSESMENT
O.D. GROUNDS (SEAD-45)

Figure 1.5
OD Grounds Groundwater
Sample Locations

NOV. 2014	1 " = 500 '	TIB

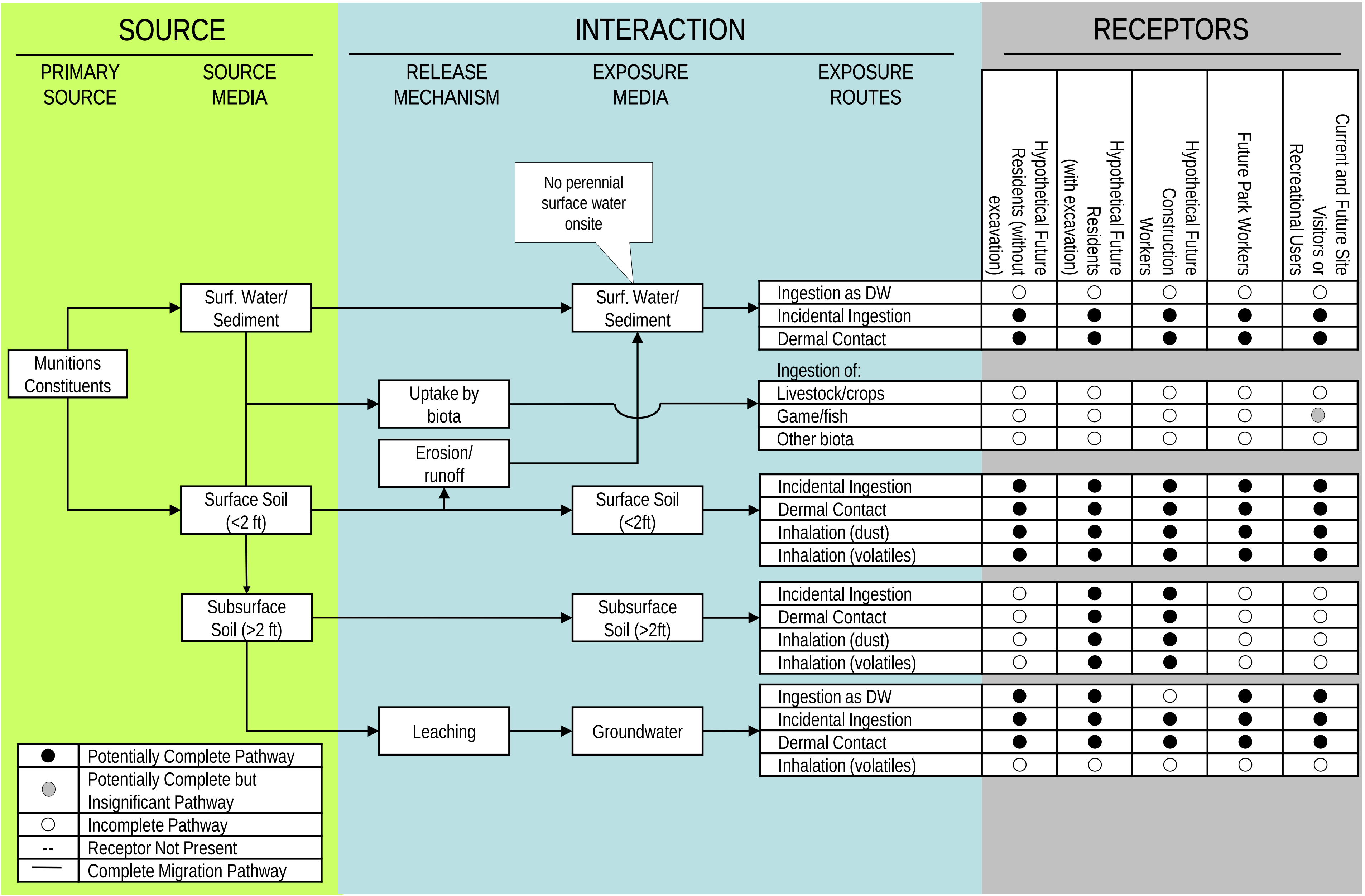
P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE B-1-5.mxd

Section 2 Figures

Figure 2.1 Human Health Conceptual Site Model Diagram

Site/MRS Name: Open Detonation (OD) Hill Area, OD Grounds, Seneca Army Depot Activity (SEDA), Seneca County, New York

Last Revised By: Jill Noel, PARSONS ***Last Revision Date:*** September 12, 2014

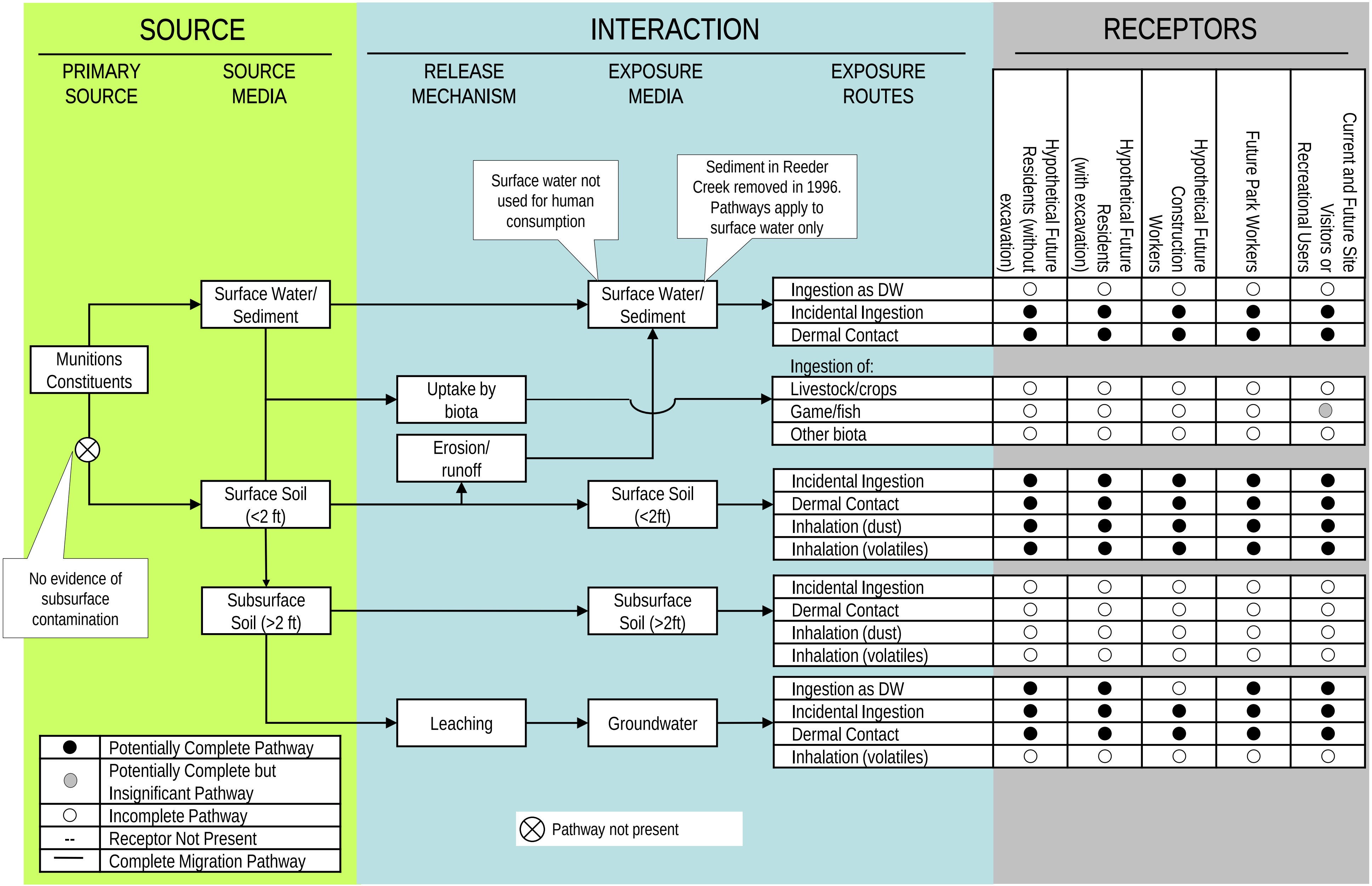


Exposure Media	Exposure Routes	Hypothetical Future Residents (without excavation)	Hypothetical Future Residents (with excavation)	Hypothetical Future Construction Workers	Future Park Workers	Current and Future Site Visitors or Recreational Users
Surf. Water/ Sediment	Ingestion as DW	○	○	○	○	○
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
Uptake by biota (Ingestion of:)	Livestock/crops	○	○	○	○	○
	Game/fish	○	○	○	○	● (grey)
	Other biota	○	○	○	○	○
Surface Soil (<2ft)	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (dust)	●	●	●	●	●
	Inhalation (volatiles)	●	●	●	●	●
Subsurface Soil (>2ft)	Incidental Ingestion	○	●	●	○	○
	Dermal Contact	○	●	●	○	○
	Inhalation (dust)	○	●	●	○	○
	Inhalation (volatiles)	○	●	●	○	○
Groundwater	Ingestion as DW	●	●	○	●	●
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (volatiles)	○	○	○	○	○

Figure 2.2 Human Health Conceptual Site Model Diagram

Site/MRS Name: Kickout Area, (OD) Grounds, Seneca Army Depot Activity (SEDA), Seneca County, New York

Last Revised By: Jill Noel, PARSONS   ***Last Revision Date:*** September 12, 2014



Exposure Media	Exposure Routes	Hypothetical Future Residents (without excavation)	Hypothetical Future Residents (with excavation)	Hypothetical Future Construction Workers	Future Park Workers	Current and Future Site Visitors or Recreational Users
Surface Water/ Sediment	Ingestion as DW	○	○	○	○	○
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
Ingestion of:	Livestock/crops	○	○	○	○	○
	Game/fish	○	○	○	○	◐ (grey)
	Other biota	○	○	○	○	○
Surface Soil (<2ft)	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (dust)	●	●	●	●	●
	Inhalation (volatiles)	●	●	●	●	●
Subsurface Soil (>2ft)	Incidental Ingestion	○	○	○	○	○
	Dermal Contact	○	○	○	○	○
	Inhalation (dust)	○	○	○	○	○
	Inhalation (volatiles)	○	○	○	○	○
Groundwater	Ingestion as DW	●	●	○	●	●
	Incidental Ingestion	●	●	●	●	●
	Dermal Contact	●	●	●	●	●
	Inhalation (volatiles)	○	○	○	○	○

●	Potentially Complete Pathway
◐ (grey)	Potentially Complete but Insignificant Pathway
○	Incomplete Pathway
--	Receptor Not Present
——	Complete Migration Pathway

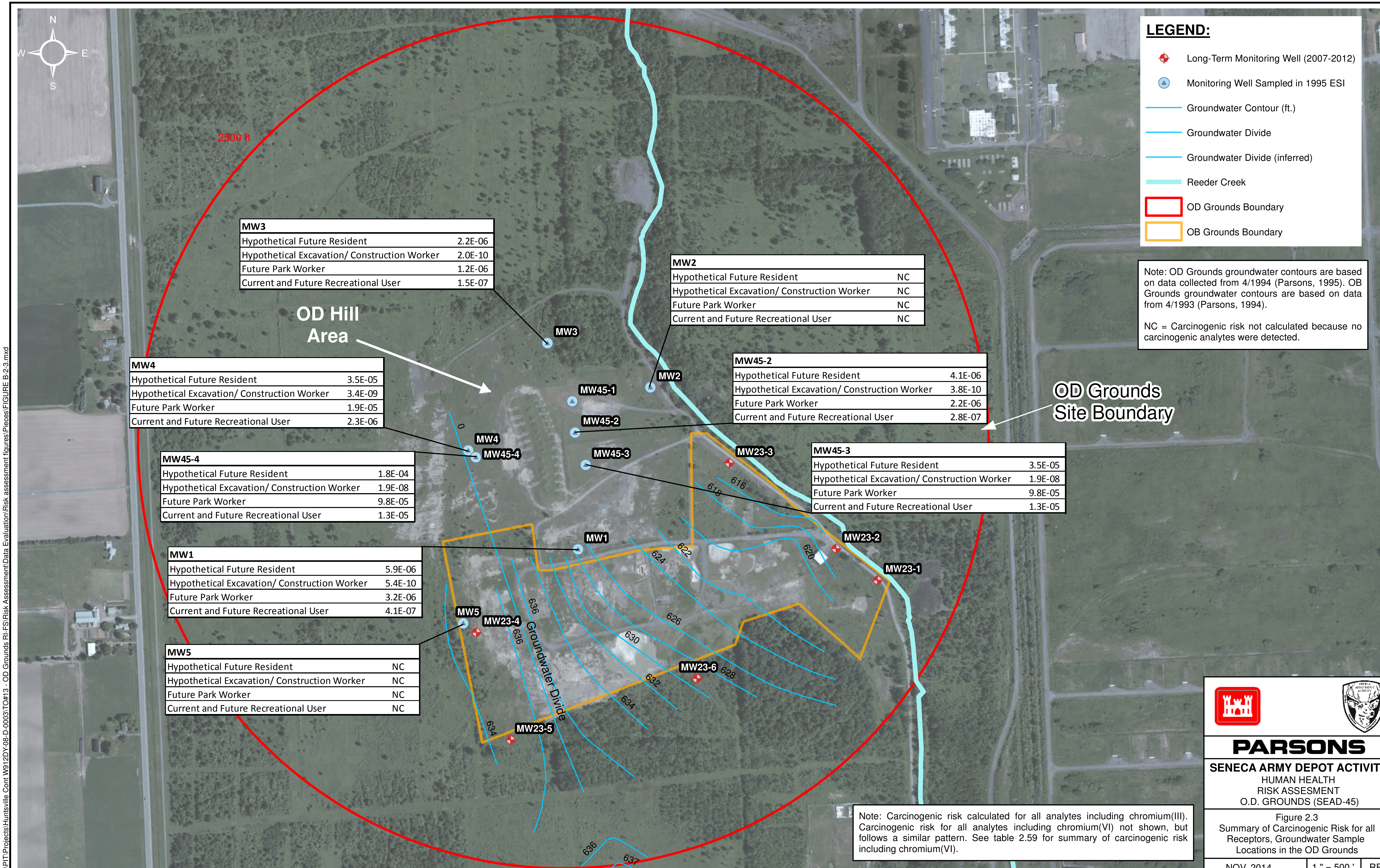
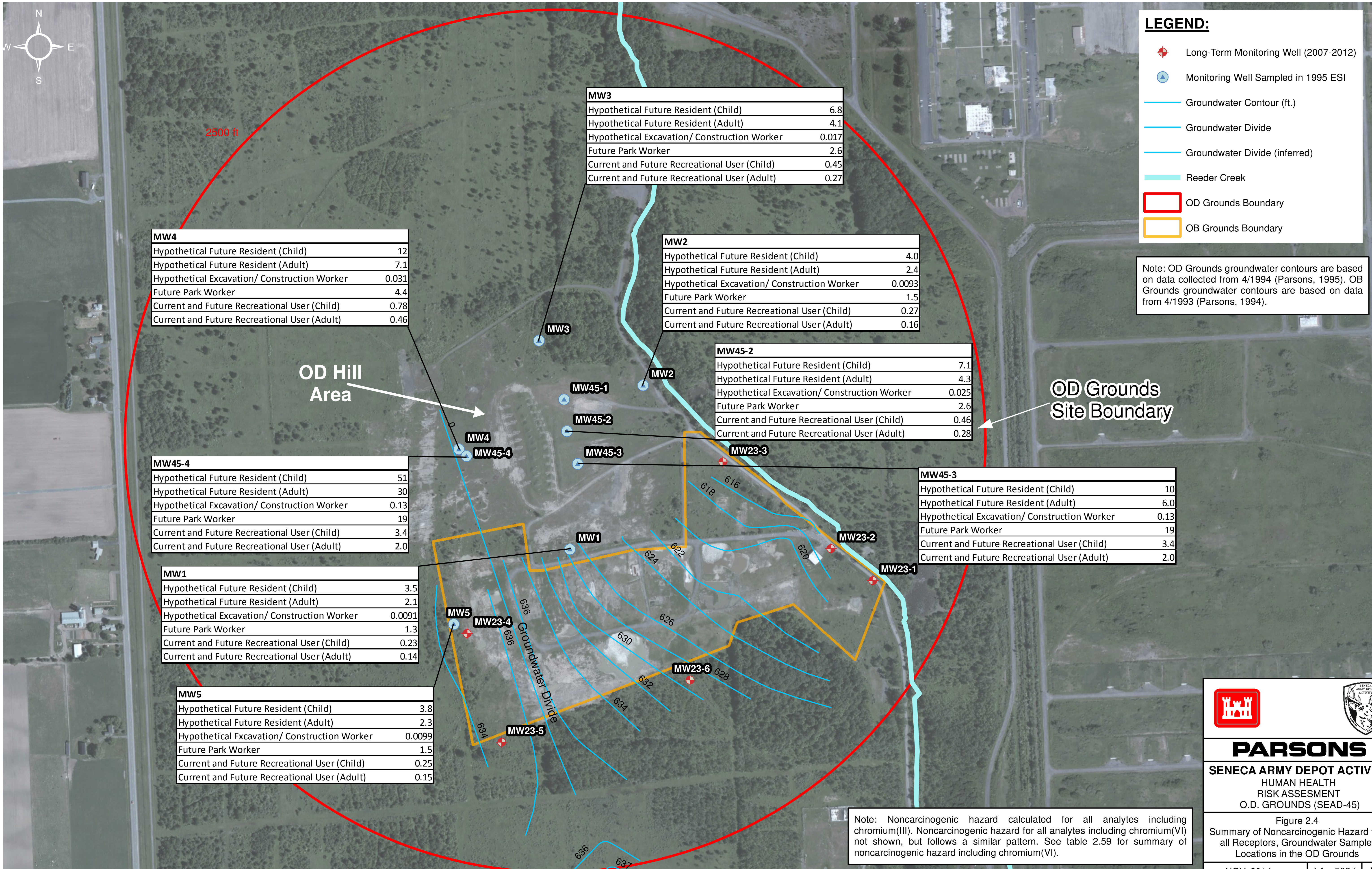


Figure 2.3
Summary of Carcinogenic Risk for all Receptors, Groundwater Sample Locations in the OD Grounds

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE B-2-3.mxd



MW3	
Hypothetical Future Resident (Child)	6.8
Hypothetical Future Resident (Adult)	4.1
Hypothetical Excavation/ Construction Worker	0.017
Future Park Worker	2.6
Current and Future Recreational User (Child)	0.45
Current and Future Recreational User (Adult)	0.27

MW4	
Hypothetical Future Resident (Child)	12
Hypothetical Future Resident (Adult)	7.1
Hypothetical Excavation/ Construction Worker	0.031
Future Park Worker	4.4
Current and Future Recreational User (Child)	0.78
Current and Future Recreational User (Adult)	0.46

MW2	
Hypothetical Future Resident (Child)	4.0
Hypothetical Future Resident (Adult)	2.4
Hypothetical Excavation/ Construction Worker	0.0093
Future Park Worker	1.5
Current and Future Recreational User (Child)	0.27
Current and Future Recreational User (Adult)	0.16

MW45-2	
Hypothetical Future Resident (Child)	7.1
Hypothetical Future Resident (Adult)	4.3
Hypothetical Excavation/ Construction Worker	0.025
Future Park Worker	2.6
Current and Future Recreational User (Child)	0.46
Current and Future Recreational User (Adult)	0.28

MW45-4	
Hypothetical Future Resident (Child)	51
Hypothetical Future Resident (Adult)	30
Hypothetical Excavation/ Construction Worker	0.13
Future Park Worker	19
Current and Future Recreational User (Child)	3.4
Current and Future Recreational User (Adult)	2.0

MW45-3	
Hypothetical Future Resident (Child)	10
Hypothetical Future Resident (Adult)	6.0
Hypothetical Excavation/ Construction Worker	0.13
Future Park Worker	19
Current and Future Recreational User (Child)	3.4
Current and Future Recreational User (Adult)	2.0

MW1	
Hypothetical Future Resident (Child)	3.5
Hypothetical Future Resident (Adult)	2.1
Hypothetical Excavation/ Construction Worker	0.0091
Future Park Worker	1.3
Current and Future Recreational User (Child)	0.23
Current and Future Recreational User (Adult)	0.14

MW5	
Hypothetical Future Resident (Child)	3.8
Hypothetical Future Resident (Adult)	2.3
Hypothetical Excavation/ Construction Worker	0.0099
Future Park Worker	1.5
Current and Future Recreational User (Child)	0.25
Current and Future Recreational User (Adult)	0.15

Note: OD Grounds groundwater contours are based on data collected from 4/1994 (Parsons, 1995). OB Grounds groundwater contours are based on data from 4/1993 (Parsons, 1994).

Note: Noncarcinogenic hazard calculated for all analytes including chromium(III). Noncarcinogenic hazard for all analytes including chromium(VI) not shown, but follows a similar pattern. See table 2.59 for summary of noncarcinogenic hazard including chromium(VI).

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SENECA ARMY DEPOT ACTIVITY
HUMAN HEALTH
RISK ASSESMENT
O.D. GROUNDS (SEAD-45)

Figure 2.4
Summary of Noncarcinogenic Hazard for all Receptors, Groundwater Sample Locations in the OD Grounds

NOV. 2014 | 1 " = 500 ' | RR

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SENECA ARMY DEPOT ACTIVITY
HUMAN HEALTH
RISK ASSESMENT
O.D. GROUNDS (SEAD-45)

Figure 2.5
Summary of Predicted Blood Lead Concentrations for Child Receptors, Groundwater Sample Locations in the OD Grounds

NOV. 2014	1 " = 500 '	RR

P:\PIT\Projects\Huntsville Cont W912DY-08-D-0003\TO#13 - OD Grounds RI-FS\Risk Assessment\Data Evaluation\Risk assessment figures\Pieces\FIGURE B-2-5.mxd

ATTACHMENT A

ProUCL Supporting Documentation

Attachment A Contents

Electronic versions of ProUCL input/pivot tables available on CD

Attachment A.1 Tables

A.1 Data Used in Risk Assessment

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Sample ID		S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG		93 U	78 U			91 U
1,2-Dichlorobenzene	UG/KG		100 U	85 U			99 U
1,3-Dichlorobenzene	UG/KG		90 U	76 U			88 U
1,4-Dichlorobenzene	UG/KG		99 U	83 U			97 U
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG		180 U	150 U			170 U
2,4,6-Trichlorophenol	UG/KG		180 U	150 U			170 U
2,4-Dichlorophenol	UG/KG		170 U	140 U			170 U
2,4-Dimethylphenol	UG/KG		190 U	160 U			190 U
2,4-Dinitrophenol	UG/KG		430 U	360 U			420 U
2,4-Dinitrotoluene	UG/KG		98 U	82 U			96 U
2,6-Dinitrotoluene	UG/KG		91 U	76 U			89 U
2-Chloronaphthalene	UG/KG		100 U	84 U			98 U
2-Chlorophenol	UG/KG		190 U	160 U			180 U
2-Methylnaphthalene	UG/KG		100 U	89 U			100 U
2-Methylphenol	UG/KG		230 U	190 U			220 U
2-Nitroaniline	UG/KG		86 U	73 U			84 U
2-Nitrophenol	UG/KG		190 U	160 U			190 U
3 or 4-Methylphenol	UG/KG		210 U	180 U			210 U
3,3'-Dichlorobenzidine	UG/KG		130 U	110 U			130 U
3-Nitroaniline	UG/KG		110 U	91 U			100 U
4,6-Dinitro-2-methylphenol	UG/KG		390 U	330 U			380 U
4-Bromophenyl phenyl ether	UG/KG		98 U	82 U			96 U
4-Chloro-3-methylphenol	UG/KG		190 U	160 U			190 U
4-Chloroaniline	UG/KG		140 U	120 U			130 U
4-Chlorophenyl phenyl ether	UG/KG		90 U	76 U			88 U
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG		150 U	130 U			150 U
4-Nitrophenol	UG/KG		360 U	300 U			350 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Sample ID		S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG		75 U	63 U			73 U
Acenaphthylene	UG/KG		80 U	68 U			79 U
Anthracene	UG/KG		96 U	81 U			95 U
Benzo(a)anthracene	UG/KG		99 U	83 U			97 U
Benzo(a)pyrene	UG/KG		110 U	90 U			100 U
Benzo(b)fluoranthene	UG/KG		150 U	130 U			150 U
Benzo(ghi)perylene	UG/KG		120 UJ	100 UJ			120 UJ
Benzo(k)fluoranthene	UG/KG		95 U	80 U			94 U
Bis(2-Chloroethoxy)methane	UG/KG		110 U	93 U			110 U
Bis(2-Chloroethyl)ether	UG/KG		93 U	78 U			91 U
Bis(2-Chloroisopropyl)ether	UG/KG		100 U	86 U			100 U
Bis(2-Ethylhexyl)phthalate	UG/KG		110 U	95 U			110 U
Butylbenzylphthalate	UG/KG		110 U	90 U			100 U
Carbazole	UG/KG		130 U	110 U			120 U
Chrysene	UG/KG		110 U	92 U			110 U
Dibenz(a,h)anthracene	UG/KG		150 U	120 U			140 U
Dibenzofuran	UG/KG		91 U	76 U			89 U
Diethyl phthalate	UG/KG		92 U	78 U			90 U
Dimethylphthalate	UG/KG		90 U	76 U			88 U
Di-n-butylphthalate	UG/KG		120 U	98 U			110 U
Di-n-octylphthalate	UG/KG		240 U	200 U			240 U
Fluoranthene	UG/KG		120 U	100 U			120 U
Fluorene	UG/KG		93 U	78 U			91 U
Hexachlorobenzene	UG/KG		94 U	79 U			92 U
Hexachlorobutadiene	UG/KG		95 U	80 U			94 U
Hexachlorocyclopentadiene	UG/KG		94 U	79 U			92 U
Hexachloroethane	UG/KG		110 U	93 U			110 U
Indeno(1,2,3-cd)pyrene	UG/KG		140 U	120 U			140 U
Isophorone	UG/KG		86 U	73 U			84 U
Naphthalene	UG/KG		100 U	84 U			98 U
Nitrobenzene	UG/KG		100 U	88 U			100 U
N-Nitrosodiphenylamine	UG/KG		310 J	210 U			250 U
N-Nitrosodipropylamine	UG/KG		95 U	80 U			94 U
Pentachlorophenol	UG/KG		270 UJ	230 UJ			270 UJ
Phenanthrene	UG/KG		95 U	80 U			94 U
Phenol	UG/KG		180 U	150 U			180 U
Pyrene	UG/KG		120 U	98 U			110 U
Herbicides							
2,4,5-T	UG/KG		18 U	18 U			19 U
2,4,5-TP/Silvex	UG/KG		14 U	14 U			15 U
2,4-D	UG/KG		36 U	37 U			38 U
2,4-DB	UG/KG		26 U	27 U			28 U
Dalapon	UG/KG		9.2 U	9.6 U			9.7 U
Dicamba	UG/KG		12 U	13 U			13 U
Dichloroprop	UG/KG		21 U	22 U			22 U
Dinoseb	UG/KG		2.9 U	3 U			3 U
MCPA	UG/KG		2,600 U	2,700 U			2,700 U
MCPP	UG/KG		2,500 U	2,600 U			2,600 U
Explosives							
1,3,5-Trinitrobenzene	UG/KG	55 J	51 JN	120 U	70 J	51 J	120 U
1,3-Dinitrobenzene	UG/KG	7.7 U	6.7 U	7.3 U	7 U	7.2 U	7.8 U
2,4,6-Trinitrotoluene	UG/KG	58 JN	45 JN	46 J	48 JN	40 J	55 JN
2,4-Dinitrotoluene	UG/KG	110 J	150	88 J	100 J	110 J	92 J
2,6-Dinitrotoluene	UG/KG	34 U	29 U	32 U	30 U	31 U	34 U
2-amino-4,6-Dinitrotoluene	UG/KG	130 J	130 J	170 JN	190 J	120	200 JN
2-Nitrotoluene	UG/KG	15 U	13 U	14 U	13 U	14 U	15 U
3,5-Dinitroaniline	UG/KG	4.4 U	3.8 U	4.4 U	4 U	4.1 U	4.4 U
3-Nitrotoluene	UG/KG	9.8 UJ	8.5 UJ	9.4 UJ	8.9 UJ	9.2 UJ	9.9 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	120 J	120	150 JN	150 J	120	190 J
4-Nitrotoluene	UG/KG	34 U	29 U	32 U	30 U	31 U	34 U
HMX	UG/KG	87 JN	72 JN	160 JN	100 J	79 J	190 JN
Nitrobenzene	UG/KG	27 U	24 U	26 U	25 U	26 U	28 U
Nitroglycerine	UG/KG	150 U	130 U	150 U	140 U	140 U	160 U
Pentaerythritol Tetranitrate	UG/KG	300 U	260 U	280 U	270 U	280 U	300 U
RDX	UG/KG	190 JN	170	440 JN	290 J	130 JN	350 JN
Tetryl	UG/KG	6.7 U	5.8 U	6.4 U	6.1 U	6.3 U	6.8 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Sample ID		S45-ODH-10-01	S45-ODH-1-01	S45-ODH-11-01	S45-ODH-12-01	S45-ODH-13-01	S45-ODH-14-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG		7 U	6.9 U			7 U
Aroclor-1221	UG/KG		16 U	16 U			16 U
Aroclor-1232	UG/KG		11 U	11 U			11 U
Aroclor-1242	UG/KG		6.8 U	6.7 U			6.8 U
Aroclor-1248	UG/KG		7.1 U	7 U			7.1 U
Aroclor-1254	UG/KG		5.5 U	5.4 U			5.5 U
Aroclor-1260	UG/KG		7 U	6.9 U			7 U
4,4'-DDD	UG/KG		0.23 U	0.23 U			0.23 U
4,4'-DDE	UG/KG		0.82 J	1.3 J			1.2 J
4,4'-DDT	UG/KG		0.87 J	1.3 JN			1.2 J
Aldrin	UG/KG		0.33 U	0.32 U			0.33 U
Alpha-BHC	UG/KG		0.4 U	0.39 U			0.4 U
Alpha-Chlordane	UG/KG		0.24 U	0.24 U			0.24 U
Beta-BHC	UG/KG		0.38 U	0.38 U			0.38 U
Delta-BHC	UG/KG		0.37 U	0.37 U			0.37 U
Dieldrin	UG/KG		0.77 J	1 J			0.96 J
Endosulfan I	UG/KG		0.79 J	32 JN			1 J
Endosulfan II	UG/KG		0.4 UJ	0.39 UJ			0.4 UJ
Endosulfan sulfate	UG/KG		0.68 U	0.67 U			0.68 U
Endrin	UG/KG		0.99 U	0.98 U			0.99 U
Endrin aldehyde	UG/KG		0.57 U	0.56 U			0.57 U
Endrin ketone	UG/KG		0.46 U	0.58 J			0.47 U
Gamma-BHC/Lindane	UG/KG		0.31 U	0.31 U			0.31 U
Gamma-Chlordane	UG/KG		0.27 U	0.26 U			0.27 U
Heptachlor	UG/KG		0.34 U	0.33 U			0.34 U
Heptachlor epoxide	UG/KG		0.26 U	0.25 U			0.26 U
Methoxychlor	UG/KG		0.58 U	0.57 U			0.58 U
Toxaphene	UG/KG		8.2 U	8 U			8.2 U
Inorganics							
Aluminum	MG/KG	18,000	19,100	17,900	16,500	19,000	23,600
Antimony	MG/KG	0.13 UJ	0.16 J	0.2 UJ	0.2 UJ	0.89 UJ	0.19 UJ
Arsenic	MG/KG	5 J	5.1 J	8.6 J	6.2 J	4.7 J	4.6 J
Barium	MG/KG	195	186	193	189	171	182
Beryllium	MG/KG	0.8	0.85	0.79	0.73	0.85	0.8
Cadmium	MG/KG	8.1	7	23.6	6.3	7.8	7.4
Calcium	MG/KG	24,400	27,800	23,200	19,400	31,400	26,700
Chromium	MG/KG	28.1	28.5	446	30.1	27.8	30.5
Cobalt	MG/KG	13.5	11.2	13.1	10.8	11.2	12.6
Copper	MG/KG	448	436	1,060	314	515	633
Cyanide	MG/KG						
Iron	MG/KG	25,800	27,200	53,100	27,700	26,300	26,500
Lead	MG/KG	62.6	55.6	64	43.1	51.7	56.7
Magnesium	MG/KG	6,780	7,140	7,040	5,860	7,710	7,000
Manganese	MG/KG	742	581	799	655	590	624
Nickel	MG/KG	39.5	37.3	59.3	37.8	36.6	39.6
Potassium	MG/KG	2,760 R	3,400 R	2,880 R	2,400 R	3,320 R	2,980 R
Selenium	MG/KG	0.29 U	0.25 U	0.44 U	0.43 U	0.24 U	0.43 U
Silver	MG/KG	3.6	3.8	5	3 U	3.6	3.5
Sodium	MG/KG	106 J	131 J	112 J	103 J	128 J	135 J
Thallium	MG/KG	0.12 U	0.23 J	0.19 U	0.18 U	0.1 J	0.18 U
Vanadium	MG/KG	29.2	31.4	30.6	25.9	31.7	29.8
Zinc	MG/KG	359	327	421	225	314	312
Mercury	MG/KG	3.8	4	4.5	3.7	1.6	4.4

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01
Sample ID		S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01D
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	DU
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG			89 U		94 U	87 U
1,2-Dichlorobenzene	UG/KG			97 U		100 U	94 U
1,3-Dichlorobenzene	UG/KG			86 U		91 U	84 U
1,4-Dichlorobenzene	UG/KG			94 U		100 U	92 U
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG			170 U		180 U	170 U
2,4,6-Trichlorophenol	UG/KG			170 U		180 U	170 U
2,4-Dichlorophenol	UG/KG			160 U		180 U	160 U
2,4-Dimethylphenol	UG/KG			180 U		190 U	180 U
2,4-Dinitrophenol	UG/KG			410 U		440 U	400 U
2,4-Dinitrotoluene	UG/KG			260 J		280 J	91 U
2,6-Dinitrotoluene	UG/KG			87 U		92 U	85 U
2-Chloronaphthalene	UG/KG			96 U		100 U	93 U
2-Chlorophenol	UG/KG			180 U		190 U	180 U
2-Methylnaphthalene	UG/KG			100 U		110 U	99 U
2-Methylphenol	UG/KG			220 U		230 U	210 U
2-Nitroaniline	UG/KG			82 U		88 U	80 U
2-Nitrophenol	UG/KG			180 U		190 U	180 U
3 or 4-Methylphenol	UG/KG			200 U		220 U	200 U
3,3'-Dichlorobenzidine	UG/KG			120 U		130 U	120 U
3-Nitroaniline	UG/KG			100 U		110 U	100 U
4,6-Dinitro-2-methylphenol	UG/KG			370 U		390 U	360 U
4-Bromophenyl phenyl ether	UG/KG			93 U		99 U	91 U
4-Chloro-3-methylphenol	UG/KG			180 U		190 U	180 U
4-Chloroaniline	UG/KG			130 U		140 U	130 U
4-Chlorophenyl phenyl ether	UG/KG			86 U		91 U	84 U
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG			150 U		160 U	140 U
4-Nitrophenol	UG/KG			340 U		360 U	330 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01
Sample ID		S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01D
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	DU
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG			71 U		76 U	70 U
Acenaphthylene	UG/KG			77 U		82 U	75 U
Anthracene	UG/KG			92 U		98 U	90 U
Benzo(a)anthracene	UG/KG			94 U		100 U	92 U
Benzo(a)pyrene	UG/KG			100 U		110 U	100 U
Benzo(b)fluoranthene	UG/KG			150 U		160 U	140 U
Benzo(ghi)perylene	UG/KG			110 UJ		120 UJ	110 UJ
Benzo(k)fluoranthene	UG/KG			91 U		97 U	89 U
Bis(2-Chloroethoxy)methane	UG/KG			100 U		110 U	100 U
Bis(2-Chloroethyl)ether	UG/KG			89 U		94 U	87 U
Bis(2-Chloroisopropyl)ether	UG/KG			98 U		100 U	96 U
Bis(2-Ethylhexyl)phthalate	UG/KG			110 U		110 U	100 U
Butylbenzylphthalate	UG/KG			100 U		110 U	100 U
Carbazole	UG/KG			120 U		130 U	120 U
Chrysene	UG/KG			100 U		110 U	100 U
Dibenz(a,h)anthracene	UG/KG			140 U		150 U	140 U
Dibenzofuran	UG/KG			87 U		92 U	85 U
Diethyl phthalate	UG/KG			88 U		93 U	86 U
Dimethylphthalate	UG/KG			86 U		91 U	84 U
Di-n-butylphthalate	UG/KG			330 J		120 U	110 U
Di-n-octylphthalate	UG/KG			230 U		250 U	230 U
Fluoranthene	UG/KG			120 U		120 U	110 U
Fluorene	UG/KG			89 U		94 U	87 U
Hexachlorobenzene	UG/KG			90 U		96 U	88 U
Hexachlorobutadiene	UG/KG			91 U		97 U	89 U
Hexachlorocyclopentadiene	UG/KG			90 U		96 U	88 U
Hexachloroethane	UG/KG			100 U		110 U	100 U
Indeno(1,2,3-cd)pyrene	UG/KG			130 U		140 U	130 U
Isophorone	UG/KG			82 U		88 U	80 U
Naphthalene	UG/KG			96 U		100 U	93 U
Nitrobenzene	UG/KG			100 U		110 U	98 U
N-Nitrosodiphenylamine	UG/KG			240 U		260 U	240 U
N-Nitrosodipropylamine	UG/KG			91 U		97 U	89 U
Pentachlorophenol	UG/KG			260 UJ		280 UJ	250 UJ
Phenanthrene	UG/KG			91 U		97 U	89 U
Phenol	UG/KG			170 U		180 U	170 U
Pyrene	UG/KG			110 U		120 U	110 U
Herbicides							
2,4,5-T	UG/KG			18 U		18 U	18 U
2,4,5-TP/Silvex	UG/KG			14 U		14 U	14 U
2,4-D	UG/KG			36 U		36 U	35 U
2,4-DB	UG/KG			26 U		26 U	26 U
Dalapon	UG/KG			9.4 U		9.2 U	9.1 U
Dicamba	UG/KG			12 U		12 U	12 U
Dichloroprop	UG/KG			21 U		21 U	21 U
Dinoseb	UG/KG			2.9 U		2.9 U	2.8 U
MCPA	UG/KG			2,600 U		2,600 U	2,600 U
MCPP	UG/KG			2,500 U		2,500 U	2,400 U
Explosives							
1,3,5-Trinitrobenzene	UG/KG	54 JN	53 JN	64 JN	120 U	56 J	60 JN
1,3-Dinitrobenzene	UG/KG	7.1 U	6.5 U	6.7 U	7.4 U	7.3 U	6.5 U
2,4,6-Trinitrotoluene	UG/KG	44 JN	41 JN	42 JN	62 J	59 J	50 JN
2,4-Dinitrotoluene	UG/KG	220	110	96 J	1,100	150	100 J
2,6-Dinitrotoluene	UG/KG	31 U	28 U	29 U	32 U	32 U	28 U
2-amino-4,6-Dinitrotoluene	UG/KG	150 J	160 J	150 J	160	190 J	220
2-Nitrotoluene	UG/KG	14 U	12 U	13 U	14 U	14 U	13 U
3,5-Dinitroaniline	UG/KG	4 U	3.7 U	3.8 U	4.2 U	4.2 U	3.7 U
3-Nitrotoluene	UG/KG	9 UJ	8.2 UJ	8.6 UJ	9.4 UJ	9.3 UJ	8.3 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	160 J	180	160	120	180	220
4-Nitrotoluene	UG/KG	31 U	28 U	29 U	32 U	32 U	28 U
HMX	UG/KG	98 JN	100 J	100 J	87 JN	180 J	92 J
Nitrobenzene	UG/KG	25 U	23 U	24 U	26 U	26 U	23 U
Nitroglycerine	UG/KG	140 U	130 U	130 U	150 U	1,500 J	130 U
Pentaerythritol Tetranitrate	UG/KG	270 U	250 U	260 U	280 U	280 U	250 U
RDX	UG/KG	180	230	180	160	540 J	200 J
Tetryl	UG/KG	6.2 U	5.6 U	5.9 U	6.5 U	6.4 U	5.7 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01
Sample ID		S45-ODH-15-01	S45-ODH-16-01	S45-ODH-17-01	S45-ODH-18-01	S45-ODH-19-01	S45-ODH-19-01D
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	DU
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	**Unit**	**Value Qual**	**Value Qual**	**Value Qual**	**Value Qual**	**Value Qual**	**Value Qual**
Pesticides/PCBs							
Aroclor-1016	UG/KG			6 U		7 U	6.7 U
Aroclor-1221	UG/KG			14 U		16 U	16 U
Aroclor-1232	UG/KG			9.2 U		11 U	10 U
Aroclor-1242	UG/KG			5.8 U		6.8 U	6.5 U
Aroclor-1248	UG/KG			6.1 U		7.1 U	6.8 U
Aroclor-1254	UG/KG			4.7 U		5.5 U	5.3 U
Aroclor-1260	UG/KG			6 U		7 U	6.7 U
4,4'-DDD	UG/KG			0.2 U		1.4 J	0.22 U
4,4'-DDE	UG/KG			0.95 J		2 J	1.6 J
4,4'-DDT	UG/KG			1.1 J		1.9 J	1.2 J
Aldrin	UG/KG			0.28 U		0.33 U	0.31 U
Alpha-BHC	UG/KG			0.34 U		0.4 U	0.38 U
Alpha-Chlordane	UG/KG			0.21 U		0.24 U	0.24 U
Beta-BHC	UG/KG			0.33 U		0.39 U	0.37 U
Delta-BHC	UG/KG			0.32 U		0.37 U	0.36 U
Dieldrin	UG/KG			0.22 U		0.26 U	0.25 U
Endosulfan I	UG/KG			0.24 UJ		1.6 J	1.2 J
Endosulfan II	UG/KG			0.34 UJ		0.4 UJ	0.88 JN
Endosulfan sulfate	UG/KG			0.58 U		0.68 U	0.65 U
Endrin	UG/KG			0.84 U		1 U	0.95 U
Endrin aldehyde	UG/KG			0.49 U		0.57 U	0.55 U
Endrin ketone	UG/KG			0.4 U		0.47 U	0.45 U
Gamma-BHC/Lindane	UG/KG			0.27 U		0.32 U	0.3 U
Gamma-Chlordane	UG/KG			0.75 J		0.27 U	0.26 U
Heptachlor	UG/KG			0.29 U		0.34 U	0.32 U
Heptachlor epoxide	UG/KG			0.22 U		0.26 U	0.25 U
Methoxychlor	UG/KG			0.5 U		0.58 U	0.56 U
Toxaphene	UG/KG			7 U		8.2 U	7.8 U
Inorganics							
Aluminum	MG/KG	19,400	17,100	16,000	14,400	17,500	16,600
Antimony	MG/KG	0.19 UJ	0.18 UJ	0.15 UJ	0.76 UJ	0.21 UJ	1.6 J
Arsenic	MG/KG	4.7 J	4.9 J	4.9 J	4 J	5.6 J	7.3 J
Barium	MG/KG	222	161	160	138	176	203
Beryllium	MG/KG	0.83	0.78	0.71	0.65	0.8	0.79
Cadmium	MG/KG	8.6	5	4.7	4.8	10.1	10.6
Calcium	MG/KG	25,300	22,200	26,000	27,600	24,400 J	18,600
Chromium	MG/KG	32.4	25.9	25.3	22	28.8	32
Cobalt	MG/KG	12.3	12.6	11.2	9	14.2	14.9
Copper	MG/KG	537	209	393	323	411 J	536
Cyanide	MG/KG						
Iron	MG/KG	27,200	24,200	24,700	21,800	35,100	44,700
Lead	MG/KG	67.8	38.4	54.8	41.5	81.4 J	74.9
Magnesium	MG/KG	6,760	6,260	6,220	6,830	6,430	6,180
Manganese	MG/KG	627	653	555	458	581 J	1,080 J
Nickel	MG/KG	41.8	35	35.1	31.4	41.9	49.6
Potassium	MG/KG	2,960 R	2,550 R	2,460 R	2,310 R	2,720 R	2,430 R
Selenium	MG/KG	0.42 U	0.4 U	0.32 U	0.21 U	0.56 J	0.36 U
Silver	MG/KG	3.5	2.8 U	2.6	2.6	3.3	4
Sodium	MG/KG	125 J	115 J	106 J	116 J	114 J	103 J
Thallium	MG/KG	0.18 U	0.17 U	0.14 U	0.2 J	0.2 U	0.15 U
Vanadium	MG/KG	29.6	27.6	27.7	23.7	27.4	26.9
Zinc	MG/KG	321	291	356	290	369	330
Mercury	MG/KG	2	1.4	6.8	3.4	3.3	3.6

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Sample ID		S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG				93 U		98 U
1,2-Dichlorobenzene	UG/KG				100 U		100 U
1,3-Dichlorobenzene	UG/KG				89 U		94 U
1,4-Dichlorobenzene	UG/KG				98 U		100 U
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG				180 U		190 U
2,4,6-Trichlorophenol	UG/KG				180 U		190 U
2,4-Dichlorophenol	UG/KG				170 U		180 U
2,4-Dimethylphenol	UG/KG				190 U		200 U
2,4-Dinitrophenol	UG/KG				430 U		450 U
2,4-Dinitrotoluene	UG/KG				97 U		100 U
2,6-Dinitrotoluene	UG/KG				90 U		95 U
2-Chloronaphthalene	UG/KG				100 U		100 U
2-Chlorophenol	UG/KG				190 U		200 U
2-Methylnaphthalene	UG/KG				100 U		110 U
2-Methylphenol	UG/KG				230 U		240 U
2-Nitroaniline	UG/KG				86 U		90 U
2-Nitrophenol	UG/KG				190 U		200 U
3 or 4-Methylphenol	UG/KG				210 U		220 U
3,3'-Dichlorobenzidine	UG/KG				130 U		140 U
3-Nitroaniline	UG/KG				110 U		110 U
4,6-Dinitro-2-methylphenol	UG/KG				390 U		400 U
4-Bromophenyl phenyl ether	UG/KG				97 U		100 U
4-Chloro-3-methylphenol	UG/KG				190 U		200 U
4-Chloroaniline	UG/KG				140 U		140 U
4-Chlorophenyl phenyl ether	UG/KG				89 U		94 U
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG				150 U		160 U
4-Nitrophenol	UG/KG				350 U		370 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Sample ID		S45-ODH-20-01	S45-ODH-2-01	S45-ODH-3-01	S45-ODH-4-01	S45-ODH-5-01	S45-ODH-6-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG				74 U		78 U
Acenaphthylene	UG/KG				80 U		84 U
Anthracene	UG/KG				96 U		100 U
Benzo(a)anthracene	UG/KG				98 U		100 U
Benzo(a)pyrene	UG/KG				110 U		110 U
Benzo(b)fluoranthene	UG/KG				150 U		160 U
Benzo(ghi)perylene	UG/KG				120 UJ		120 UJ
Benzo(k)fluoranthene	UG/KG				95 U		100 U
Bis(2-Chloroethoxy)methane	UG/KG				110 U		120 U
Bis(2-Chloroethyl)ether	UG/KG				93 U		98 U
Bis(2-Chloroisopropyl)ether	UG/KG				100 U		110 U
Bis(2-Ethylhexyl)phthalate	UG/KG				110 U		120 U
Butylbenzylphthalate	UG/KG				110 U		110 U
Carbazole	UG/KG				130 U		130 U
Chrysene	UG/KG				110 U		110 U
Dibenz(a,h)anthracene	UG/KG				150 U		150 U
Dibenzofuran	UG/KG				90 U		95 U
Diethyl phthalate	UG/KG				92 U		96 U
Dimethylphthalate	UG/KG				89 U		94 U
Di-n-butylphthalate	UG/KG				120 U		120 U
Di-n-octylphthalate	UG/KG				240 U		250 U
Fluoranthene	UG/KG				120 U		130 U
Fluorene	UG/KG				93 U		98 U
Hexachlorobenzene	UG/KG				94 U		99 U
Hexachlorobutadiene	UG/KG				95 U		100 U
Hexachlorocyclopentadiene	UG/KG				94 U		99 U
Hexachloroethane	UG/KG				110 U		120 U
Indeno(1,2,3-cd)pyrene	UG/KG				140 U		150 U
Isophorone	UG/KG				86 U		90 U
Naphthalene	UG/KG				100 U		100 U
Nitrobenzene	UG/KG				100 U		110 U
N-Nitrosodiphenylamine	UG/KG				250 U		260 U
N-Nitrosodipropylamine	UG/KG				95 U		100 U
Pentachlorophenol	UG/KG				270 UJ		280 UJ
Phenanthrene	UG/KG				95 U		100 U
Phenol	UG/KG				180 U		190 U
Pyrene	UG/KG				120 U		120 U
Herbicides							
2,4,5-T	UG/KG				17 U		19 U
2,4,5-TP/Silvex	UG/KG				13 U		15 U
2,4-D	UG/KG				34 U		38 U
2,4-DB	UG/KG				25 U		28 U
Dalapon	UG/KG				8.7 U		9.7 U
Dicamba	UG/KG				12 U		13 U
Dichloroprop	UG/KG				20 U		22 U
Dinoseb	UG/KG				2.7 U		3 U
MCPA	UG/KG				2,400 U		2,700 U
MCPP	UG/KG				2,300 U		2,600 U
Explosives							
1,3,5-Trinitrobenzene	UG/KG	100 U	79 JN	49 JN	62 JN	57 JN	46 J
1,3-Dinitrobenzene	UG/KG	6.5 U	6 U	6.1 U	7.5 U	6.8 U	7.2 U
2,4,6-Trinitrotoluene	UG/KG	51 J	29 JN	36 JN	45 JN	40 JN	39 JN
2,4-Dinitrotoluene	UG/KG	220	99	120	83 J	100 J	64 J
2,6-Dinitrotoluene	UG/KG	28 U	26 U	26 U	33 U	29 U	31 U
2-amino-4,6-Dinitrotoluene	UG/KG	130 J	130 J	140	160 J	160 J	99 J
2-Nitrotoluene	UG/KG	13 U	12 U	12 U	14 U	13 U	14 U
3,5-Dinitroaniline	UG/KG	3.7 U	3.4 U	3.5 U	4.3 U	3.8 U	4.1 U
3-Nitrotoluene	UG/KG	8.3 U	7.7 UJ	7.8 UJ	9.6 UJ	8.6 UJ	9.1 UJ
4-amino-2,6-Dinitrotoluene	UG/KG	120	130	140	150 J	160 J	94 J
4-Nitrotoluene	UG/KG	28 U	26 U	26 U	33 U	29 U	31 U
HMX	UG/KG	68 JN	100 J	120 J	110 JN	120 J	120 U
Nitrobenzene	UG/KG	23 U	21 U	22 U	27 U	24 U	25 U
Nitroglycerine	UG/KG	130 U	120 U	120 U	150 U	140 U	140 U
Pentaerythritol Tetranitrate	UG/KG	250 U	230 U	240 U	290 U	260 U	280 U
RDX	UG/KG	140	180	220	210	210	120 J
Tetryl	UG/KG	5.7 U	5.3 U	5.3 U	6.6 U	5.9 U	6.2 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-ODH-20-01		S45-ODH-2-01		S45-ODH-3-01		S45-ODH-4-01		S45-ODH-5-01		S45-ODH-6-01	
Sample ID		S45-ODH-20-01		S45-ODH-2-01		S45-ODH-3-01		S45-ODH-4-01		S45-ODH-5-01		S45-ODH-6-01	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		3/12/2010		3/12/2010		3/12/2010		3/12/2010		3/12/2010		3/12/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Pesticides/PCBs													
Aroclor-1016	UG/KG							6.6	U			7.2	U
Aroclor-1221	UG/KG							15	U			17	U
Aroclor-1232	UG/KG							10	U			11	U
Aroclor-1242	UG/KG							6.4	U			7	U
Aroclor-1248	UG/KG							6.8	U			7.3	U
Aroclor-1254	UG/KG							2,000				5.6	U
Aroclor-1260	UG/KG							6.6	U			7.2	U
4,4'-DDD	UG/KG							0.22	U			0.24	U
4,4'-DDE	UG/KG							0.21	U			0.89	J
4,4'-DDT	UG/KG							0.34	U			0.88	J
Aldrin	UG/KG							0.31	U			0.34	U
Alpha-BHC	UG/KG							0.38	U			0.41	U
Alpha-Chlordane	UG/KG							0.23	U			0.25	U
Beta-BHC	UG/KG							0.36	U			0.4	U
Delta-BHC	UG/KG							0.35	U			0.38	U
Dieldrin	UG/KG							0.24	U			0.84	J
Endosulfan I	UG/KG							0.26	UJ			0.79	J
Endosulfan II	UG/KG							0.38	UJ			0.41	UJ
Endosulfan sulfate	UG/KG							0.64	U			0.7	U
Endrin	UG/KG							0.94	U			1	U
Endrin aldehyde	UG/KG							0.54	U			0.59	U
Endrin ketone	UG/KG							0.44	U			0.48	U
Gamma-BHC/Lindane	UG/KG							0.3	U			0.32	U
Gamma-Chlordane	UG/KG							0.25	U			0.28	U
Heptachlor	UG/KG							0.32	U			0.35	U
Heptachlor epoxide	UG/KG							0.24	U			0.26	U
Methoxychlor	UG/KG							45				0.6	U
Toxaphene	UG/KG							7.7	U			8.4	U
Inorganics													
Aluminum	MG/KG	18,000		17,500		17,200		15,000		19,400		18,000	
Antimony	MG/KG	1.3	UJ	0.19	UJ	0.2	UJ	0.47	UJ	0.2	UJ	0.19	UJ
Arsenic	MG/KG	5.3	J	12.4	J	11	J	12.6	J	5.6	J	4.6	J
Barium	MG/KG	150		190		179		220		194		163	
Beryllium	MG/KG	0.79		0.78		0.77		0.67		0.86		0.8	
Cadmium	MG/KG	7.4		8.7		8.6		1,100		7.5		6.9	
Calcium	MG/KG	22,900		26,600		43,900		23,200		23,400		25,500	
Chromium	MG/KG	30		29.9		29.8		37.8		29.7		28	
Cobalt	MG/KG	12.7		12		12.9		14		12.3		11.9	
Copper	MG/KG	434		433		477		1,780		411		4,180	
Cyanide	MG/KG												
Iron	MG/KG	27,900		34,200		29,600		118,000		27,200		24,700	
Lead	MG/KG	50.8		56.3		59.9		57.2		61.9		217	
Magnesium	MG/KG	7,310		6,720		6,410		5,680		7,010		7,190	
Manganese	MG/KG	580		610		642		648		618		582	
Nickel	MG/KG	41.3		41.2		39.5		46.2		41.2		37	
Potassium	MG/KG	2,580	R	2,850	R	2,850	R	2,160	R	3,410	R	3,190	R
Selenium	MG/KG	0.35	U	0.42	U	0.45	U	1.03	U	0.44	U	0.41	U
Silver	MG/KG	3.8		3.4		4		205		3.2		2.8	U
Sodium	MG/KG	107	J	110	J	110	J	103	J	116	J	121	J
Thallium	MG/KG	0.15	U	0.18	U	0.19	U	0.44	U	0.19	U	0.17	U
Vanadium	MG/KG	28.7		28.5		28.7		24.4		31.7		29.4	
Zinc	MG/KG	299		327		368		1,270		337		319	
Mercury	MG/KG	3.5		4.3		4.3		3.1		4.3		3.6	

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Sample ID		S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/16/2010	3/16/2010	3/16/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG		93 U				
1,2-Dichlorobenzene	UG/KG		100 U				
1,3-Dichlorobenzene	UG/KG		89 U				
1,4-Dichlorobenzene	UG/KG		98 U				
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG		180 U				
2,4,6-Trichlorophenol	UG/KG		180 U				
2,4-Dichlorophenol	UG/KG		170 U				
2,4-Dimethylphenol	UG/KG		190 U				
2,4-Dinitrophenol	UG/KG		430 U				
2,4-Dinitrotoluene	UG/KG		97 U				
2,6-Dinitrotoluene	UG/KG		90 U				
2-Chloronaphthalene	UG/KG		99 U				
2-Chlorophenol	UG/KG		190 U				
2-Methylnaphthalene	UG/KG		100 U				
2-Methylphenol	UG/KG		230 U				
2-Nitroaniline	UG/KG		86 U				
2-Nitrophenol	UG/KG		190 U				
3 or 4-Methylphenol	UG/KG		210 U				
3,3'-Dichlorobenzidine	UG/KG		130 U				
3-Nitroaniline	UG/KG		110 U				
4,6-Dinitro-2-methylphenol	UG/KG		380 U				
4-Bromophenyl phenyl ether	UG/KG		97 U				
4-Chloro-3-methylphenol	UG/KG		190 U				
4-Chloroaniline	UG/KG		140 U				
4-Chlorophenyl phenyl ether	UG/KG		89 U				
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG		150 U				
4-Nitrophenol	UG/KG		350 U				

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Sample ID		S45-ODH-7-01	S45-ODH-8-01	S45-ODH-9-01	S45-R10-01	S45-R10-02	S45-R10-03
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/16/2010	3/16/2010	3/16/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG		74 U				
Acenaphthylene	UG/KG		80 U				
Anthracene	UG/KG		96 U				
Benzo(a)anthracene	UG/KG		98 U				
Benzo(a)pyrene	UG/KG		110 U				
Benzo(b)fluoranthene	UG/KG		150 U				
Benzo(ghi)perylene	UG/KG		120 UJ				
Benzo(k)fluoranthene	UG/KG		95 U				
Bis(2-Chloroethoxy)methane	UG/KG		110 U				
Bis(2-Chloroethyl)ether	UG/KG		93 U				
Bis(2-Chloroisopropyl)ether	UG/KG		100 U				
Bis(2-Ethylhexyl)phthalate	UG/KG		110 U				
Butylbenzylphthalate	UG/KG		110 U				
Carbazole	UG/KG		130 U				
Chrysene	UG/KG		130 J				
Dibenz(a,h)anthracene	UG/KG		150 U				
Dibenzofuran	UG/KG		90 U				
Diethyl phthalate	UG/KG		91 U				
Dimethylphthalate	UG/KG		89 U				
Di-n-butylphthalate	UG/KG		120 U				
Di-n-octylphthalate	UG/KG		240 U				
Fluoranthene	UG/KG		120 U				
Fluorene	UG/KG		93 U				
Hexachlorobenzene	UG/KG		94 U				
Hexachlorobutadiene	UG/KG		95 U				
Hexachlorocyclopentadiene	UG/KG		94 U				
Hexachloroethane	UG/KG		110 U				
Indeno(1,2,3-cd)pyrene	UG/KG		140 U				
Isophorone	UG/KG		86 U				
Naphthalene	UG/KG		99 U				
Nitrobenzene	UG/KG		100 U				
N-Nitrosodiphenylamine	UG/KG		250 U				
N-Nitrosodipropylamine	UG/KG		95 U				
Pentachlorophenol	UG/KG		270 UJ				
Phenanthrene	UG/KG		95 U				
Phenol	UG/KG		180 U				
Pyrene	UG/KG		120 U				
Herbicides							
2,4,5-T	UG/KG		17 U				
2,4,5-TP/Silvex	UG/KG		14 U				
2,4-D	UG/KG		35 U				
2,4-DB	UG/KG		25 U				
Dalapon	UG/KG		9 U				
Dicamba	UG/KG		12 U				
Dichloroprop	UG/KG		20 U				
Dinoseb	UG/KG		2.8 UJ				
MCPA	UG/KG		2,500 U				
MCPP	UG/KG		2,400 U				
Explosives							
1,3,5-Trinitrobenzene	UG/KG	65 JN	60 JN	68 J			
1,3-Dinitrobenzene	UG/KG	7.7 U	5.7 U	7.1 U			
2,4,6-Trinitrotoluene	UG/KG	49 JN	51 J	47 J			
2,4-Dinitrotoluene	UG/KG	91 J	86 J	110 J			
2,6-Dinitrotoluene	UG/KG	34 U	25 U	31 U			
2-amino-4,6-Dinitrotoluene	UG/KG	190 J	180	220			
2-Nitrotoluene	UG/KG	15 U	11 U	14 U			
3,5-Dinitroaniline	UG/KG	4.4 U	3.2 U	4 U			
3-Nitrotoluene	UG/KG	9.8 UJ	7.2 UJ	9 UJ			
4-amino-2,6-Dinitrotoluene	UG/KG	160 J	160	220			
4-Nitrotoluene	UG/KG	34 U	25 U	31 U			
HMX	UG/KG	150 J	150	190			
Nitrobenzene	UG/KG	27 U	20 U	25 U			
Nitroglycerine	UG/KG	150 U	110 U	140 U			
Pentaerythritol Tetranitrate	UG/KG	300 U	220 U	270 U			
RDX	UG/KG	310	340	420			
Tetryl	UG/KG	6.7 U	5 U	6.2 U			

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-ODH-7-01		S45-ODH-8-01		S45-ODH-9-01		S45-R10-01		S45-R10-02		S45-R10-03	
Sample ID		S45-ODH-7-01		S45-ODH-8-01		S45-ODH-9-01		S45-R10-01		S45-R10-02		S45-R10-03	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		3/12/2010		3/12/2010		3/12/2010		3/16/2010		3/16/2010		3/16/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Pesticides/PCBs													
Aroclor-1016	UG/KG			7	U								
Aroclor-1221	UG/KG			16	U								
Aroclor-1232	UG/KG			11	U								
Aroclor-1242	UG/KG			6.8	U								
Aroclor-1248	UG/KG			7.2	U								
Aroclor-1254	UG/KG			5.5	U								
Aroclor-1260	UG/KG			7	U								
4,4'-DDD	UG/KG			0.23	U								
4,4'-DDE	UG/KG			1.1	J								
4,4'-DDT	UG/KG			1.1	J								
Aldrin	UG/KG			0.33	U								
Alpha-BHC	UG/KG			0.4	U								
Alpha-Chlordane	UG/KG			0.25	U								
Beta-BHC	UG/KG			0.39	U								
Delta-BHC	UG/KG			0.38	U								
Dieldrin	UG/KG			0.87	J								
Endosulfan I	UG/KG			1	J								
Endosulfan II	UG/KG			0.4	UJ								
Endosulfan sulfate	UG/KG			0.68	U								
Endrin	UG/KG			1	U								
Endrin aldehyde	UG/KG			0.57	U								
Endrin ketone	UG/KG			0.47	U								
Gamma-BHC/Lindane	UG/KG			0.32	U								
Gamma-Chlordane	UG/KG			0.27	U								
Heptachlor	UG/KG			0.34	U								
Heptachlor epoxide	UG/KG			0.26	U								
Methoxychlor	UG/KG			0.59	U								
Toxaphene	UG/KG			8.2	U								
Inorganics													
Aluminum	MG/KG	22,200		17,700		20,300		20,700		22,100		18,100	
Antimony	MG/KG	0.28	J	0.2	UJ	0.22	UJ	0.12	UJ	0.13	UJ	0.88	J
Arsenic	MG/KG	4.8	J	4.9	J	5.5	J	5.3		5.1		5.1	
Barium	MG/KG	174		187		266		141	J	109	J	167	J
Beryllium	MG/KG	0.82		0.81		0.88		0.87	J	0.88	J	0.8	J
Cadmium	MG/KG	8		8.9		8		1	J	1.3	U	1.8	
Calcium	MG/KG	24,500		23,300		22,800		3,790	J	2,750	J	27,800	J
Chromium	MG/KG	40.8		30.9		30.8		24.1	J	29.6	J	31.4	J
Cobalt	MG/KG	10.6		14		12.4		8.9	J	9.9	J	12.4	J
Copper	MG/KG	648		442		490		32.8		47.2	J	92.6	J
Cyanide	MG/KG												
Iron	MG/KG	25,900		28,000		27,700		22,500	J	24,900	J	28,300	J
Lead	MG/KG	59.3		61.2		62.5		19.4	J	46.4		123	
Magnesium	MG/KG	6,420		6,870		7,090		4,320	J	4,480	J	7,560	J
Manganese	MG/KG	557		710		601		682	J	256	J	437	J
Nickel	MG/KG	36.1		43.4		40.9		23.5	J	32.2	J	49.7	J
Potassium	MG/KG	3,200	R	2,700	R	3,440	R	2,920	J	3,400	J	2,950	J
Selenium	MG/KG	0.23	U	0.45	U	0.73	J	0.26	U	0.28	U	0.38	U
Silver	MG/KG	3.8		3.4		4		0.08	U	0.18	J	0.11	U
Sodium	MG/KG	120	J	110	J	135	J	138		130	U	126	
Thallium	MG/KG	0.1	U	0.19	U	0.2	U	0.11	U	1.9	U	2.6	U
Vanadium	MG/KG	28.4		27.8		32.5		33.3	J	37.8	J	26.9	J
Zinc	MG/KG	433		356		357		85.6	J	140	J	185	J
Mercury	MG/KG	6		3		3.6		0.38		0.28		0.79	

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
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Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R10-03	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Sample ID		S45-R10-03D	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	4/1/2010
QC Type		DU	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG						
1,2-Dichlorobenzene	UG/KG						
1,3-Dichlorobenzene	UG/KG						
1,4-Dichlorobenzene	UG/KG						
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG						
2,4,6-Trichlorophenol	UG/KG						
2,4-Dichlorophenol	UG/KG						
2,4-Dimethylphenol	UG/KG						
2,4-Dinitrophenol	UG/KG						
2,4-Dinitrotoluene	UG/KG						
2,6-Dinitrotoluene	UG/KG						
2-Chloronaphthalene	UG/KG						
2-Chlorophenol	UG/KG						
2-Methylnaphthalene	UG/KG						
2-Methylphenol	UG/KG						
2-Nitroaniline	UG/KG						
2-Nitrophenol	UG/KG						
3 or 4-Methylphenol	UG/KG						
3,3'-Dichlorobenzidine	UG/KG						
3-Nitroaniline	UG/KG						
4,6-Dinitro-2-methylphenol	UG/KG						
4-Bromophenyl phenyl ether	UG/KG						
4-Chloro-3-methylphenol	UG/KG						
4-Chloroaniline	UG/KG						
4-Chlorophenyl phenyl ether	UG/KG						
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG						
4-Nitrophenol	UG/KG						

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R10-03		S45-R10-04		S45-R10-05		S45-R10-06		S45-R10-07		S45-R1-01	
Sample ID		S45-R10-03D		S45-R10-04		S45-R10-05		S45-R10-06		S45-R10-07		S45-R1-01	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		3/16/2010		3/16/2010		3/16/2010		3/16/2010		3/16/2010		4/1/2010	
QC Type		DU		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Acenaphthene	UG/KG												
Acenaphthylene	UG/KG												
Anthracene	UG/KG												
Benzo(a)anthracene	UG/KG												
Benzo(a)pyrene	UG/KG												
Benzo(b)fluoranthene	UG/KG												
Benzo(ghi)perylene	UG/KG												
Benzo(k)fluoranthene	UG/KG												
Bis(2-Chloroethoxy)methane	UG/KG												
Bis(2-Chloroethyl)ether	UG/KG												
Bis(2-Chloroisopropyl)ether	UG/KG												
Bis(2-Ethylhexyl)phthalate	UG/KG												
Butylbenzylphthalate	UG/KG												
Carbazole	UG/KG												
Chrysene	UG/KG												
Dibenz(a,h)anthracene	UG/KG												
Dibenzofuran	UG/KG												
Diethyl phthalate	UG/KG												
Dimethylphthalate	UG/KG												
Di-n-butylphthalate	UG/KG												
Di-n-octylphthalate	UG/KG												
Fluoranthene	UG/KG												
Fluorene	UG/KG												
Hexachlorobenzene	UG/KG												
Hexachlorobutadiene	UG/KG												
Hexachlorocyclopentadiene	UG/KG												
Hexachloroethane	UG/KG												
Indeno(1,2,3-cd)pyrene	UG/KG												
Isophorone	UG/KG												
Naphthalene	UG/KG												
Nitrobenzene	UG/KG												
N-Nitrosodiphenylamine	UG/KG												
N-Nitrosodipropylamine	UG/KG												
Pentachlorophenol	UG/KG												
Phenanthrene	UG/KG												
Phenol	UG/KG												
Pyrene	UG/KG												
Herbicides													
2,4,5-T	UG/KG												
2,4,5-TP/Silvex	UG/KG												
2,4-D	UG/KG												
2,4-DB	UG/KG												
Dalapon	UG/KG												
Dicamba	UG/KG												
Dichloroprop	UG/KG												
Dinoseb	UG/KG												
MCPA	UG/KG												
MCPP	UG/KG												
Explosives													
1,3,5-Trinitrobenzene	UG/KG												
1,3-Dinitrobenzene	UG/KG												
2,4,6-Trinitrotoluene	UG/KG												
2,4-Dinitrotoluene	UG/KG												
2,6-Dinitrotoluene	UG/KG												
2-amino-4,6-Dinitrotoluene	UG/KG												
2-Nitrotoluene	UG/KG												
3,5-Dinitroaniline	UG/KG												
3-Nitrotoluene	UG/KG												
4-amino-2,6-Dinitrotoluene	UG/KG												
4-Nitrotoluene	UG/KG												
HMX	UG/KG												
Nitrobenzene	UG/KG												
Nitroglycerine	UG/KG												
Pentaerythritol Tetranitrate	UG/KG												
RDX	UG/KG												
Tetryl	UG/KG												

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R10-03	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Sample ID		S45-R10-03D	S45-R10-04	S45-R10-05	S45-R10-06	S45-R10-07	S45-R1-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	4/1/2010
QC Type		DU	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest

Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG						
Aroclor-1221	UG/KG						
Aroclor-1232	UG/KG						
Aroclor-1242	UG/KG						
Aroclor-1248	UG/KG						
Aroclor-1254	UG/KG						
Aroclor-1260	UG/KG						
4,4'-DDD	UG/KG						
4,4'-DDE	UG/KG						
4,4'-DDT	UG/KG						
Aldrin	UG/KG						
Alpha-BHC	UG/KG						
Alpha-Chlordane	UG/KG						
Beta-BHC	UG/KG						
Delta-BHC	UG/KG						
Dieldrin	UG/KG						
Endosulfan I	UG/KG						
Endosulfan II	UG/KG						
Endosulfan sulfate	UG/KG						
Endrin	UG/KG						
Endrin aldehyde	UG/KG						
Endrin ketone	UG/KG						
Gamma-BHC/Lindane	UG/KG						
Gamma-Chlordane	UG/KG						
Heptachlor	UG/KG						
Heptachlor epoxide	UG/KG						
Methoxychlor	UG/KG						
Toxaphene	UG/KG						
Inorganics							
Aluminum	MG/KG	16,700	19,100	19,900	17,400	16,500	17,200
Antimony	MG/KG	2.4	0.09 UJ	0.14 UJ	0.11 UJ	1.8 J	0.52 J
Arsenic	MG/KG	5	4.8	4.6	4	4.5	5.9
Barium	MG/KG	256 J	108 J	134 J	107 J	263 J	259
Beryllium	MG/KG	0.76 J	0.77 J	0.86 J	0.68 J	0.76 J	0.75
Cadmium	MG/KG	1.6 U	0.96 U	1.4 U	1.2 U	1.6 U	7.6
Calcium	MG/KG	28,500 J	2,840 J	4,100 J	3,700 J	14,500 J	23,200
Chromium	MG/KG	29.2 J	23.9 J	25.5 J	22.4 J	29.2 J	35.3
Cobalt	MG/KG	12.5 J	10.5 J	9.6 J	7.7 J	12.1 J	12.2
Copper	MG/KG	132	24.9 J	44.7 J	64 J	129 J	475
Cyanide	MG/KG						
Iron	MG/KG	28,800 J	21,900 J	22,700 J	20,500 J	27,500 J	31,400
Lead	MG/KG	189	21.7	25.2	35.4	198	54.7
Magnesium	MG/KG	6,880 J	3,630 J	4,050 J	3,650 J	6,640 J	6,460
Manganese	MG/KG	436 J	999 J	627 J	446 J	393 J	657
Nickel	MG/KG	46.9 J	21.6 J	27.1 J	21.4 J	47.4 J	43
Potassium	MG/KG	2,610 J	2,580 J	3,250 J	2,320 J	2,400 J	2,590
Selenium	MG/KG	0.34 U	0.21 U	0.3 U	0.25 U	0.92 J	1.7 U
Silver	MG/KG	0.1 U	0.06 U	0.09 U	0.08 U	0.11 U	4.4
Sodium	MG/KG	110	96 U	140 U	120 U	97.1	86 U
Thallium	MG/KG	0.14 U	0.09 U	0.13 U	0.11 U	2.4 U	0.28 U
Vanadium	MG/KG	25.3 J	32.4 J	33 J	29.6 J	24.5 J	28.5
Zinc	MG/KG	298	85.7 J	130 J	136 J	237 J	319
Mercury	MG/KG	1	0.17	0.45	0.71	0.38	5.5

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R1-02		S45-R1-03		S45-R1-04		S45-R1-04D		S45-R15-01		S45-R15-02	
Sample ID		S45-R1-02		S45-R1-03		S45-R1-04		S45-R1-04D		S45-R15-01		S45-R15-02	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		4/1/2010		4/1/2010		4/1/2010		4/1/2010		3/15/2010		3/16/2010	
QC Type		SA		SA		SA		DU		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Volatile Organic Compounds													
1,1,1-Trichloroethane	UG/KG												
1,1,2,2-Tetrachloroethane	UG/KG												
1,1,2-Trichloroethane	UG/KG												
1,1-Dichloroethane	UG/KG												
1,1-Dichloroethene	UG/KG												
1,2-Dichloroethane	UG/KG												
1,2-Dichloroethene (total)	UG/KG												
1,2-Dichloropropane	UG/KG												
Acetone	UG/KG												
Benzene	UG/KG												
Bromodichloromethane	UG/KG												
Bromoform	UG/KG												
Carbon disulfide	UG/KG												
Carbon tetrachloride	UG/KG												
Chlorobenzene	UG/KG												
Chlorodibromomethane	UG/KG												
Chloroethane	UG/KG												
Chloroform	UG/KG												
Cis-1,3-Dichloropropene	UG/KG												
Ethyl benzene	UG/KG												
Methyl bromide	UG/KG												
Methyl butyl ketone	UG/KG												
Methyl chloride	UG/KG												
Methyl ethyl ketone	UG/KG												
Methyl isobutyl ketone	UG/KG												
Methylene chloride	UG/KG												
Styrene	UG/KG												
Tetrachloroethene	UG/KG												
Toluene	UG/KG												
Total Xylenes	UG/KG												
Trans-1,3-Dichloropropene	UG/KG												
Trichloroethene	UG/KG												
Vinyl chloride	UG/KG												
Semivolatile Organic Compounds													
1,2,4-Trichlorobenzene	UG/KG												
1,2-Dichlorobenzene	UG/KG												
1,3-Dichlorobenzene	UG/KG												
1,4-Dichlorobenzene	UG/KG												
2,2'-oxybis(1-Chloropropane)	UG/KG												
2,4,5-Trichlorophenol	UG/KG												
2,4,6-Trichlorophenol	UG/KG												
2,4-Dichlorophenol	UG/KG												
2,4-Dimethylphenol	UG/KG												
2,4-Dinitrophenol	UG/KG												
2,4-Dinitrotoluene	UG/KG												
2,6-Dinitrotoluene	UG/KG												
2-Chloronaphthalene	UG/KG												
2-Chlorophenol	UG/KG												
2-Methylnaphthalene	UG/KG												
2-Methylphenol	UG/KG												
2-Nitroaniline	UG/KG												
2-Nitrophenol	UG/KG												
3 or 4-Methylphenol	UG/KG												
3,3'-Dichlorobenzidine	UG/KG												
3-Nitroaniline	UG/KG												
4,6-Dinitro-2-methylphenol	UG/KG												
4-Bromophenyl phenyl ether	UG/KG												
4-Chloro-3-methylphenol	UG/KG												
4-Chloroaniline	UG/KG												
4-Chlorophenyl phenyl ether	UG/KG												
4-Methylphenol	UG/KG												
4-Nitroaniline	UG/KG												
4-Nitrophenol	UG/KG												

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R1-02		S45-R1-03		S45-R1-04		S45-R1-04D		S45-R15-01		S45-R15-02	
Sample ID		S45-R1-02		S45-R1-03		S45-R1-04		S45-R1-04D		S45-R15-01		S45-R15-02	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		4/1/2010		4/1/2010		4/1/2010		4/1/2010		3/15/2010		3/16/2010	
QC Type		SA		SA		SA		DU		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Acenaphthene	UG/KG												
Acenaphthylene	UG/KG												
Anthracene	UG/KG												
Benzo(a)anthracene	UG/KG												
Benzo(a)pyrene	UG/KG												
Benzo(b)fluoranthene	UG/KG												
Benzo(ghi)perylene	UG/KG												
Benzo(k)fluoranthene	UG/KG												
Bis(2-Chloroethoxy)methane	UG/KG												
Bis(2-Chloroethyl)ether	UG/KG												
Bis(2-Chloroisopropyl)ether	UG/KG												
Bis(2-Ethylhexyl)phthalate	UG/KG												
Butylbenzylphthalate	UG/KG												
Carbazole	UG/KG												
Chrysene	UG/KG												
Dibenz(a,h)anthracene	UG/KG												
Dibenzofuran	UG/KG												
Diethyl phthalate	UG/KG												
Dimethylphthalate	UG/KG												
Di-n-butylphthalate	UG/KG												
Di-n-octylphthalate	UG/KG												
Fluoranthene	UG/KG												
Fluorene	UG/KG												
Hexachlorobenzene	UG/KG												
Hexachlorobutadiene	UG/KG												
Hexachlorocyclopentadiene	UG/KG												
Hexachloroethane	UG/KG												
Indeno(1,2,3-cd)pyrene	UG/KG												
Isophorone	UG/KG												
Naphthalene	UG/KG												
Nitrobenzene	UG/KG												
N-Nitrosodiphenylamine	UG/KG												
N-Nitrosodipropylamine	UG/KG												
Pentachlorophenol	UG/KG												
Phenanthrene	UG/KG												
Phenol	UG/KG												
Pyrene	UG/KG												
Herbicides													
2,4,5-T	UG/KG												
2,4,5-TP/Silvex	UG/KG												
2,4-D	UG/KG												
2,4-DB	UG/KG												
Dalapon	UG/KG												
Dicamba	UG/KG												
Dichloroprop	UG/KG												
Dinoseb	UG/KG												
MCPA	UG/KG												
MCPP	UG/KG												
Explosives													
1,3,5-Trinitrobenzene	UG/KG												
1,3-Dinitrobenzene	UG/KG												
2,4,6-Trinitrotoluene	UG/KG												
2,4-Dinitrotoluene	UG/KG												
2,6-Dinitrotoluene	UG/KG												
2-amino-4,6-Dinitrotoluene	UG/KG												
2-Nitrotoluene	UG/KG												
3,5-Dinitroaniline	UG/KG												
3-Nitrotoluene	UG/KG												
4-amino-2,6-Dinitrotoluene	UG/KG												
4-Nitrotoluene	UG/KG												
HMX	UG/KG												
Nitrobenzene	UG/KG												
Nitroglycerine	UG/KG												
Pentaerythritol Tetranitrate	UG/KG												
RDX	UG/KG												
Tetryl	UG/KG												

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Sample ID		S45-R1-02	S45-R1-03	S45-R1-04	S45-R1-04D	S45-R15-01	S45-R15-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/15/2010	3/16/2010
QC Type		SA	SA	SA	DU	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG						
Aroclor-1221	UG/KG						
Aroclor-1232	UG/KG						
Aroclor-1242	UG/KG						
Aroclor-1248	UG/KG						
Aroclor-1254	UG/KG						
Aroclor-1260	UG/KG						
4,4'-DDD	UG/KG						
4,4'-DDE	UG/KG						
4,4'-DDT	UG/KG						
Aldrin	UG/KG						
Alpha-BHC	UG/KG						
Alpha-Chlordane	UG/KG						
Beta-BHC	UG/KG						
Delta-BHC	UG/KG						
Dieldrin	UG/KG						
Endosulfan I	UG/KG						
Endosulfan II	UG/KG						
Endosulfan sulfate	UG/KG						
Endrin	UG/KG						
Endrin aldehyde	UG/KG						
Endrin ketone	UG/KG						
Gamma-BHC/Lindane	UG/KG						
Gamma-Chlordane	UG/KG						
Heptachlor	UG/KG						
Heptachlor epoxide	UG/KG						
Methoxychlor	UG/KG						
Toxaphene	UG/KG						
Inorganics							
Aluminum	MG/KG	16,200	18,200	16,800	20,200	19,900	25,000
Antimony	MG/KG	0.64 J	0.65 J	0.81 J	0.37 J	0.25 UJ	0.12 UJ
Arsenic	MG/KG	5.1	5.5	4.9	5.5	7.6	5.4
Barium	MG/KG	150	168	161	182	287 J	175 J
Beryllium	MG/KG	0.72	0.81	0.89 U	0.85	1 J	1 J
Cadmium	MG/KG	7.7	8.2	7.9	8.1	2.6 U	1.2 U
Calcium	MG/KG	26,900	21,700	40,600 U	22,000	3,630 J	4,370 J
Chromium	MG/KG	27.4	30.3	27	30.7	24.6 J	30.8 J
Cobalt	MG/KG	12.3	12.7	11.4	12.2	26.8 J	10 J
Copper	MG/KG	794	478	467	433	22.8 J	25.6 J
Cyanide	MG/KG						
Iron	MG/KG	25,200	25,800	26,700	28,100	35,300 J	26,200 J
Lead	MG/KG	69.2	62.2	63.8	58	22	26.6
Magnesium	MG/KG	7,910	6,520	6,890	6,920	4,080 J	4,460 J
Manganese	MG/KG	676	664	557	561	5,040 J	552 J
Nickel	MG/KG	39.6	41.8	37	40.5	29.8 J	27.1 J
Potassium	MG/KG	2,450	2,690	2,600	3,370	2,780 J	3,850 J
Selenium	MG/KG	0.7 U	0.75 U	0.7 U	0.85 U	0.56 U	0.27 U
Silver	MG/KG	3.2	4	3.9	3.2 J	0.17 U	0.08 U
Sodium	MG/KG	89 U	95.6	93.3	86.8 J	130 U	120 U
Thallium	MG/KG	0.29 U	0.32 U	0.3 U	0.36 U	0.24 U	0.12 U
Vanadium	MG/KG	27.3	29.8	28.3	32.8	30.7 J	41.9 J
Zinc	MG/KG	1,350	328	404	347	101 J	104 J
Mercury	MG/KG	3.5	3.5	3.1	4.4	0.21	0.1

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Sample ID		S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/17/2010	3/15/2010	3/15/2010	3/15/2010	4/1/2010	4/1/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG						
1,2-Dichlorobenzene	UG/KG						
1,3-Dichlorobenzene	UG/KG						
1,4-Dichlorobenzene	UG/KG						
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG						
2,4,6-Trichlorophenol	UG/KG						
2,4-Dichlorophenol	UG/KG						
2,4-Dimethylphenol	UG/KG						
2,4-Dinitrophenol	UG/KG						
2,4-Dinitrotoluene	UG/KG						
2,6-Dinitrotoluene	UG/KG						
2-Chloronaphthalene	UG/KG						
2-Chlorophenol	UG/KG						
2-Methylnaphthalene	UG/KG						
2-Methylphenol	UG/KG						
2-Nitroaniline	UG/KG						
2-Nitrophenol	UG/KG						
3 or 4-Methylphenol	UG/KG						
3,3'-Dichlorobenzidine	UG/KG						
3-Nitroaniline	UG/KG						
4,6-Dinitro-2-methylphenol	UG/KG						
4-Bromophenyl phenyl ether	UG/KG						
4-Chloro-3-methylphenol	UG/KG						
4-Chloroaniline	UG/KG						
4-Chlorophenyl phenyl ether	UG/KG						
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG						
4-Nitrophenol	UG/KG						

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R15-03		S45-R15-04		S45-R15-05		S45-R15-06		S45-R2-01		S45-R2-02	
Sample ID		S45-R15-03		S45-R15-04		S45-R15-05		S45-R15-06		S45-R2-01		S45-R2-02	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		3/17/2010		3/15/2010		3/15/2010		3/15/2010		4/1/2010		4/1/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Acenaphthene	UG/KG												
Acenaphthylene	UG/KG												
Anthracene	UG/KG												
Benzo(a)anthracene	UG/KG												
Benzo(a)pyrene	UG/KG												
Benzo(b)fluoranthene	UG/KG												
Benzo(ghi)perylene	UG/KG												
Benzo(k)fluoranthene	UG/KG												
Bis(2-Chloroethoxy)methane	UG/KG												
Bis(2-Chloroethyl)ether	UG/KG												
Bis(2-Chloroisopropyl)ether	UG/KG												
Bis(2-Ethylhexyl)phthalate	UG/KG												
Butylbenzylphthalate	UG/KG												
Carbazole	UG/KG												
Chrysene	UG/KG												
Dibenz(a,h)anthracene	UG/KG												
Dibenzofuran	UG/KG												
Diethyl phthalate	UG/KG												
Dimethylphthalate	UG/KG												
Di-n-butylphthalate	UG/KG												
Di-n-octylphthalate	UG/KG												
Fluoranthene	UG/KG												
Fluorene	UG/KG												
Hexachlorobenzene	UG/KG												
Hexachlorobutadiene	UG/KG												
Hexachlorocyclopentadiene	UG/KG												
Hexachloroethane	UG/KG												
Indeno(1,2,3-cd)pyrene	UG/KG												
Isophorone	UG/KG												
Naphthalene	UG/KG												
Nitrobenzene	UG/KG												
N-Nitrosodiphenylamine	UG/KG												
N-Nitrosodipropylamine	UG/KG												
Pentachlorophenol	UG/KG												
Phenanthrene	UG/KG												
Phenol	UG/KG												
Pyrene	UG/KG												
Herbicides													
2,4,5-T	UG/KG												
2,4,5-TP/Silvex	UG/KG												
2,4-D	UG/KG												
2,4-DB	UG/KG												
Dalapon	UG/KG												
Dicamba	UG/KG												
Dichloroprop	UG/KG												
Dinoseb	UG/KG												
MCPA	UG/KG												
MCPP	UG/KG												
Explosives													
1,3,5-Trinitrobenzene	UG/KG												
1,3-Dinitrobenzene	UG/KG												
2,4,6-Trinitrotoluene	UG/KG												
2,4-Dinitrotoluene	UG/KG												
2,6-Dinitrotoluene	UG/KG												
2-amino-4,6-Dinitrotoluene	UG/KG												
2-Nitrotoluene	UG/KG												
3,5-Dinitroaniline	UG/KG												
3-Nitrotoluene	UG/KG												
4-amino-2,6-Dinitrotoluene	UG/KG												
4-Nitrotoluene	UG/KG												
HMX	UG/KG												
Nitrobenzene	UG/KG												
Nitroglycerine	UG/KG												
Pentaerythritol Tetranitrate	UG/KG												
RDX	UG/KG												
Tetryl	UG/KG												

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Sample ID		S45-R15-03	S45-R15-04	S45-R15-05	S45-R15-06	S45-R2-01	S45-R2-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/17/2010	3/15/2010	3/15/2010	3/15/2010	4/1/2010	4/1/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG						
Aroclor-1221	UG/KG						
Aroclor-1232	UG/KG						
Aroclor-1242	UG/KG						
Aroclor-1248	UG/KG						
Aroclor-1254	UG/KG						
Aroclor-1260	UG/KG						
4,4'-DDD	UG/KG						
4,4'-DDE	UG/KG						
4,4'-DDT	UG/KG						
Aldrin	UG/KG						
Alpha-BHC	UG/KG						
Alpha-Chlordane	UG/KG						
Beta-BHC	UG/KG						
Delta-BHC	UG/KG						
Dieldrin	UG/KG						
Endosulfan I	UG/KG						
Endosulfan II	UG/KG						
Endosulfan sulfate	UG/KG						
Endrin	UG/KG						
Endrin aldehyde	UG/KG						
Endrin ketone	UG/KG						
Gamma-BHC/Lindane	UG/KG						
Gamma-Chlordane	UG/KG						
Heptachlor	UG/KG						
Heptachlor epoxide	UG/KG						
Methoxychlor	UG/KG						
Toxaphene	UG/KG						
Inorganics							
Aluminum	MG/KG	14,200 J	18,700	17,000	20,700	17,800	17,700
Antimony	MG/KG	0.41 UJ	0.1 UJ	0.09 UJ	0.12 UJ	0.26 J	0.62 J
Arsenic	MG/KG	4.9 J	4.8	3.9	5.1	6.3	5.4
Barium	MG/KG	55.4 J	108 J	107 J	135 J	144	164
Beryllium	MG/KG	0.65 J	0.85 J	0.77 J	1 J	0.77	0.86
Cadmium	MG/KG	4.1 UJ	0.98 U	0.94 U	1.2 U	4.2	9.1
Calcium	MG/KG	9,010 J	2,150 J	3,560 J	2,340 J	28,100	20,800
Chromium	MG/KG	26.6 J	24.2 J	23.3 J	27.5 J	27.2	27.7
Cobalt	MG/KG	12.1 J	10.1 J	9.1 J	12.9 J	12	11.8
Copper	MG/KG	43.1 J	20 J	23.4 J	23.3 J	192	462
Cyanide	MG/KG						
Iron	MG/KG	26,000 J	22,500 J	20,400 J	24,000 J	24,400	27,600
Lead	MG/KG	53.2 J	20.6	22.8	27.9	50	72.3
Magnesium	MG/KG	6,180 J	3,770 J	3,800 J	4,210 J	7,290	6,560
Manganese	MG/KG	328 J	735 J	466 J	1,080 J	581	618
Nickel	MG/KG	52.1 J	24.8 J	29.4 J	32.7 J	39.9	39.8
Potassium	MG/KG	2,140 J	2,740 J	2,780 J	3,410 J	2,540	2,920
Selenium	MG/KG	0.9 UJ	0.21 U	0.21 U	0.26 U	0.59 U	0.72 U
Silver	MG/KG	0.27 UJ	0.06 U	0.06 U	0.08 U	1.4 J	3.6
Sodium	MG/KG	82 UJ	98 U	94 U	120 U	99.2	92 U
Thallium	MG/KG	0.38 UJ	0.09 U	0.09 U	0.11 U	0.25 U	0.3 U
Vanadium	MG/KG	22.5 J	31.3 J	27.1 J	33.8 J	29.7	30.9
Zinc	MG/KG	114 J	76 J	80 J	114 J	382	321
Mercury	MG/KG	0.1 J	0.06	0.09	0.1	1.2	3

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Sample ID		S45-R2-03	S45-R2-04	S45-R3-01	S45-R3-02	S45-R3-03	S45-R3-04
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010	4/1/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG						
1,2-Dichlorobenzene	UG/KG						
1,3-Dichlorobenzene	UG/KG						
1,4-Dichlorobenzene	UG/KG						
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG						
2,4,6-Trichlorophenol	UG/KG						
2,4-Dichlorophenol	UG/KG						
2,4-Dimethylphenol	UG/KG						
2,4-Dinitrophenol	UG/KG						
2,4-Dinitrotoluene	UG/KG						
2,6-Dinitrotoluene	UG/KG						
2-Chloronaphthalene	UG/KG						
2-Chlorophenol	UG/KG						
2-Methylnaphthalene	UG/KG						
2-Methylphenol	UG/KG						
2-Nitroaniline	UG/KG						
2-Nitrophenol	UG/KG						
3 or 4-Methylphenol	UG/KG						
3,3'-Dichlorobenzidine	UG/KG						
3-Nitroaniline	UG/KG						
4,6-Dinitro-2-methylphenol	UG/KG						
4-Bromophenyl phenyl ether	UG/KG						
4-Chloro-3-methylphenol	UG/KG						
4-Chloroaniline	UG/KG						
4-Chlorophenyl phenyl ether	UG/KG						
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG						
4-Nitrophenol	UG/KG						

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R2-03		S45-R2-04		S45-R3-01		S45-R3-02		S45-R3-03		S45-R3-04	
Sample ID		S45-R2-03		S45-R2-04		S45-R3-01		S45-R3-02		S45-R3-03		S45-R3-04	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		4/1/2010		4/1/2010		4/1/2010		4/1/2010		4/1/2010		4/1/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Acenaphthene	UG/KG												
Acenaphthylene	UG/KG												
Anthracene	UG/KG												
Benzo(a)anthracene	UG/KG												
Benzo(a)pyrene	UG/KG												
Benzo(b)fluoranthene	UG/KG												
Benzo(ghi)perylene	UG/KG												
Benzo(k)fluoranthene	UG/KG												
Bis(2-Chloroethoxy)methane	UG/KG												
Bis(2-Chloroethyl)ether	UG/KG												
Bis(2-Chloroisopropyl)ether	UG/KG												
Bis(2-Ethylhexyl)phthalate	UG/KG												
Butylbenzylphthalate	UG/KG												
Carbazole	UG/KG												
Chrysene	UG/KG												
Dibenz(a,h)anthracene	UG/KG												
Dibenzofuran	UG/KG												
Diethyl phthalate	UG/KG												
Dimethylphthalate	UG/KG												
Di-n-butylphthalate	UG/KG												
Di-n-octylphthalate	UG/KG												
Fluoranthene	UG/KG												
Fluorene	UG/KG												
Hexachlorobenzene	UG/KG												
Hexachlorobutadiene	UG/KG												
Hexachlorocyclopentadiene	UG/KG												
Hexachloroethane	UG/KG												
Indeno(1,2,3-cd)pyrene	UG/KG												
Isophorone	UG/KG												
Naphthalene	UG/KG												
Nitrobenzene	UG/KG												
N-Nitrosodiphenylamine	UG/KG												
N-Nitrosodipropylamine	UG/KG												
Pentachlorophenol	UG/KG												
Phenanthrene	UG/KG												
Phenol	UG/KG												
Pyrene	UG/KG												
Herbicides													
2,4,5-T	UG/KG												
2,4,5-TP/Silvex	UG/KG												
2,4-D	UG/KG												
2,4-DB	UG/KG												
Dalapon	UG/KG												
Dicamba	UG/KG												
Dichloroprop	UG/KG												
Dinoseb	UG/KG												
MCPA	UG/KG												
MCPP	UG/KG												
Explosives													
1,3,5-Trinitrobenzene	UG/KG												
1,3-Dinitrobenzene	UG/KG												
2,4,6-Trinitrotoluene	UG/KG												
2,4-Dinitrotoluene	UG/KG												
2,6-Dinitrotoluene	UG/KG												
2-amino-4,6-Dinitrotoluene	UG/KG												
2-Nitrotoluene	UG/KG												
3,5-Dinitroaniline	UG/KG												
3-Nitrotoluene	UG/KG												
4-amino-2,6-Dinitrotoluene	UG/KG												
4-Nitrotoluene	UG/KG												
HMX	UG/KG												
Nitrobenzene	UG/KG												
Nitroglycerine	UG/KG												
Pentaerythritol Tetranitrate	UG/KG												
RDX	UG/KG												
Tetryl	UG/KG												

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R2-03		S45-R2-04		S45-R3-01		S45-R3-02		S45-R3-03		S45-R3-04	
Sample ID		S45-R2-03		S45-R2-04		S45-R3-01		S45-R3-02		S45-R3-03		S45-R3-04	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6		0.2-0.6	
Sample Date		4/1/2010		4/1/2010		4/1/2010		4/1/2010		4/1/2010		4/1/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Pesticides/PCBs													
Aroclor-1016	UG/KG												
Aroclor-1221	UG/KG												
Aroclor-1232	UG/KG												
Aroclor-1242	UG/KG												
Aroclor-1248	UG/KG												
Aroclor-1254	UG/KG												
Aroclor-1260	UG/KG												
4,4'-DDD	UG/KG												
4,4'-DDE	UG/KG												
4,4'-DDT	UG/KG												
Aldrin	UG/KG												
Alpha-BHC	UG/KG												
Alpha-Chlordane	UG/KG												
Beta-BHC	UG/KG												
Delta-BHC	UG/KG												
Dieldrin	UG/KG												
Endosulfan I	UG/KG												
Endosulfan II	UG/KG												
Endosulfan sulfate	UG/KG												
Endrin	UG/KG												
Endrin aldehyde	UG/KG												
Endrin ketone	UG/KG												
Gamma-BHC/Lindane	UG/KG												
Gamma-Chlordane	UG/KG												
Heptachlor	UG/KG												
Heptachlor epoxide	UG/KG												
Methoxychlor	UG/KG												
Toxaphene	UG/KG												
Inorganics													
Aluminum	MG/KG	19,000		17,900		20,800		16,800		24,600		18,500	
Antimony	MG/KG	0.98	J	0.32	J	0.24	J	0.87	J	0.68	J	0.13	U
Arsenic	MG/KG	5.1		5.2		5.7		5.2		5.1		4.2	
Barium	MG/KG	166		150		140		194		205		122	
Beryllium	MG/KG	0.83		0.78		0.78		0.72		1		0.78	
Cadmium	MG/KG	6.6		6.4		6		8.3		8.2		1.1	U
Calcium	MG/KG	16,900		22,300		32,600		36,400		18,400		8,950	
Chromium	MG/KG	28.6		29.3		27.9		27.4		35.4		24.7	
Cobalt	MG/KG	12.3		11.7		12		10.8		12.6		9.8	
Copper	MG/KG	217		364		284		233		429		41.3	
Cyanide	MG/KG												
Iron	MG/KG	26,600		26,500		25,300		25,400		29,100		22,900	
Lead	MG/KG	51		52.9		48.9		70.3		69.4		28.2	
Magnesium	MG/KG	6,530		7,100		7,260		9,130		7,340		4,720	
Manganese	MG/KG	676		518		651		530		470		549	
Nickel	MG/KG	40.1		41.4		37.4		38.3		46.6		28.9	
Potassium	MG/KG	3,240		2,920		2,980		2,550		4,020		2,260	
Selenium	MG/KG	0.81	U	0.69	U	1.7	U	0.76	U	0.9	U	0.45	U
Silver	MG/KG	2.5	J	3		0.82	J	1.9	J	3	J	0.29	J
Sodium	MG/KG	77	J	90.2		92.2		120		93.7	J	66.2	J
Thallium	MG/KG	0.34	U	0.29	U	0.28	U	0.32	U	0.38	U	0.19	U
Vanadium	MG/KG	31.7		28.6		30.2		27		38.9		30.8	
Zinc	MG/KG	274		324		392		588		421		91.2	
Mercury	MG/KG	3.1		5.3		1.7		6.4		4.2		2.2	

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Sample ID		S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/16/2010	3/16/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG					100 U	
1,2-Dichlorobenzene	UG/KG					110 U	
1,3-Dichlorobenzene	UG/KG					98 U	
1,4-Dichlorobenzene	UG/KG					110 U	
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG					200 U	
2,4,6-Trichlorophenol	UG/KG					200 UJ	
2,4-Dichlorophenol	UG/KG					190 UJ	
2,4-Dimethylphenol	UG/KG					210 UJ	
2,4-Dinitrophenol	UG/KG					470 UJ	
2,4-Dinitrotoluene	UG/KG					110 U	
2,6-Dinitrotoluene	UG/KG					99 U	
2-Chloronaphthalene	UG/KG					110 UJ	
2-Chlorophenol	UG/KG					210 UJ	
2-Methylnaphthalene	UG/KG					120 U	
2-Methylphenol	UG/KG					250 UJ	
2-Nitroaniline	UG/KG					94 U	
2-Nitrophenol	UG/KG					210 UJ	
3 or 4-Methylphenol	UG/KG					240 UJ	
3,3'-Dichlorobenzidine	UG/KG					140 UJ	
3-Nitroaniline	UG/KG					120 UJ	
4,6-Dinitro-2-methylphenol	UG/KG					420 U	
4-Bromophenyl phenyl ether	UG/KG					110 U	
4-Chloro-3-methylphenol	UG/KG					210 U	
4-Chloroaniline	UG/KG					150 UJ	
4-Chlorophenyl phenyl ether	UG/KG					98 U	
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG					170 UJ	
4-Nitrophenol	UG/KG					390 U	

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Sample ID		S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/16/2010	3/16/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG					82 U	
Acenaphthylene	UG/KG					88 U	
Anthracene	UG/KG					100 U	
Benzo(a)anthracene	UG/KG					110 U	
Benzo(a)pyrene	UG/KG					120 U	
Benzo(b)fluoranthene	UG/KG					170 U	
Benzo(ghi)perylene	UG/KG					130 U	
Benzo(k)fluoranthene	UG/KG					100 U	
Bis(2-Chloroethoxy)methane	UG/KG					120 UJ	
Bis(2-Chloroethyl)ether	UG/KG					100 U	
Bis(2-Chloroisopropyl)ether	UG/KG					110 U	
Bis(2-Ethylhexyl)phthalate	UG/KG					120 U	
Butylbenzylphthalate	UG/KG					120 U	
Carbazole	UG/KG					140 U	
Chrysene	UG/KG					120 U	
Dibenz(a,h)anthracene	UG/KG					160 U	
Dibenzofuran	UG/KG					99 U	
Diethyl phthalate	UG/KG					100 U	
Dimethylphthalate	UG/KG					98 U	
Di-n-butylphthalate	UG/KG					130 U	
Di-n-octylphthalate	UG/KG					260 U	
Fluoranthene	UG/KG					130 U	
Fluorene	UG/KG					100 U	
Hexachlorobenzene	UG/KG					100 U	
Hexachlorobutadiene	UG/KG					100 U	
Hexachlorocyclopentadiene	UG/KG					100 UJ	
Hexachloroethane	UG/KG					120 U	
Indeno(1,2,3-cd)pyrene	UG/KG					150 U	
Isophorone	UG/KG					94 U	
Naphthalene	UG/KG					110 U	
Nitrobenzene	UG/KG					110 U	
N-Nitrosodiphenylamine	UG/KG					280 UJ	
N-Nitrosodipropylamine	UG/KG					100 U	
Pentachlorophenol	UG/KG					300 UJ	
Phenanthrene	UG/KG					100 U	
Phenol	UG/KG					200 U	
Pyrene	UG/KG					130 U	
Herbicides							
2,4,5-T	UG/KG					20 U	
2,4,5-TP/Silvex	UG/KG					16 U	
2,4-D	UG/KG					40 U	
2,4-DB	UG/KG					29 U	
Dalapon	UG/KG					10 U	
Dicamba	UG/KG					14 U	
Dichloroprop	UG/KG					23 U	
Dinoseb	UG/KG					3.2 UJ	
MCPA	UG/KG					2,900 U	
MCPP	UG/KG					2,800 U	
Explosives							
1,3,5-Trinitrobenzene	UG/KG					8.5 U	
1,3-Dinitrobenzene	UG/KG					7.9 U	
2,4,6-Trinitrotoluene	UG/KG					8.5 U	
2,4-Dinitrotoluene	UG/KG					19 U	
2,6-Dinitrotoluene	UG/KG					34 U	
2-amino-4,6-Dinitrotoluene	UG/KG					27 U	
2-Nitrotoluene	UG/KG					15 U	
3,5-Dinitroaniline	UG/KG					4.5 U	
3-Nitrotoluene	UG/KG					10 UJ	
4-amino-2,6-Dinitrotoluene	UG/KG					22 U	
4-Nitrotoluene	UG/KG					34 U	
HMX	UG/KG					11 U	
Nitrobenzene	UG/KG					28 U	
Nitroglycerine	UG/KG					160 U	
Pentaerythritol Tetranitrate	UG/KG					300 U	
RDX	UG/KG					8.6 U	
Tetryl	UG/KG					6.9 UJ	

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Sample ID		S45-R4-01	S45-R4-02	S45-R4-03	S45-R4-04	S45-R5-01	S45-R5-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010	3/16/2010	3/16/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG					7.4 U	
Aroclor-1221	UG/KG					17 U	
Aroclor-1232	UG/KG					11 U	
Aroclor-1242	UG/KG					7.1 U	
Aroclor-1248	UG/KG					7.5 U	
Aroclor-1254	UG/KG					5.8 U	
Aroclor-1260	UG/KG					7.4 U	
4,4'-DDD	UG/KG					0.24 U	
4,4'-DDE	UG/KG					1.6 J	
4,4'-DDT	UG/KG					0.38 U	
Aldrin	UG/KG					0.34 U	
Alpha-BHC	UG/KG					0.42 U	
Alpha-Chlordane	UG/KG					0.26 U	
Beta-BHC	UG/KG					0.4 U	
Delta-BHC	UG/KG					0.39 U	
Dieldrin	UG/KG					0.96 J	
Endosulfan I	UG/KG					23 J	
Endosulfan II	UG/KG					0.42 UJ	
Endosulfan sulfate	UG/KG					0.71 U	
Endrin	UG/KG					1 U	
Endrin aldehyde	UG/KG					0.6 UJ	
Endrin ketone	UG/KG					0.49 U	
Gamma-BHC/Lindane	UG/KG					0.33 U	
Gamma-Chlordane	UG/KG					0.28 U	
Heptachlor	UG/KG					0.36 U	
Heptachlor epoxide	UG/KG					0.27 U	
Methoxychlor	UG/KG					0.61 U	
Toxaphene	UG/KG					8.6 U	
Inorganics							
Aluminum	MG/KG	19,000	21,300	19,400	5,910	17,200	16,700
Antimony	MG/KG	0.18 U	0.42 J	0.11 U	2.2	0.14 J	3.1
Arsenic	MG/KG	5.7	5	4.6	4	5	5.1
Barium	MG/KG	140	299	89.7	27.9	152 J	257 J
Beryllium	MG/KG	0.88	0.81	0.69	0.43 U	0.74 J	0.71 J
Cadmium	MG/KG	1.6 U	4.1	1 U	0.86 U	6	3.3
Calcium	MG/KG	13,200	40,500	2,900	193,000	31,200 J	17,100 J
Chromium	MG/KG	28.4	29.7	25.1	10.6	26.1 J	25.6 J
Cobalt	MG/KG	10.9	11.4	9.4	9.5	11.1 J	10 J
Copper	MG/KG	82.6	263	39.1	38.9	221	289
Cyanide	MG/KG						
Iron	MG/KG	24,000	26,500	23,100	7,600	26,000 J	24,300 J
Lead	MG/KG	22.5	28.3	21	29.7	86.2	352
Magnesium	MG/KG	6,750	7,880	4,460	15,000	7,210 J	6,870 J
Manganese	MG/KG	428	606	361	363	583 J	438 J
Nickel	MG/KG	37	42.5	26.2	23.8	38.1 J	32.5 J
Potassium	MG/KG	2,970	2,880	2,610	2,620	2,780 J	2,470 J
Selenium	MG/KG	0.63 U	0.82 U	0.4 U	0.34 U	0.23 U	0.23 U
Silver	MG/KG	0.42 J	0.47 J	0.23 J	0.04 U	1.6 U	1.6 U
Sodium	MG/KG	81 U	112	59.1 J	179	135	110
Thallium	MG/KG	0.27 U	0.35 U	0.17 U	0.14 U	0.1 U	0.1 U
Vanadium	MG/KG	33.6	29.5	32.2	16.6	26.7 J	27.5 J
Zinc	MG/KG	160	938	99.2	66.8	284 J	335 J
Mercury	MG/KG	1.4	0.9	0.48	0.15	3.7	1.6

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R5-03	S45-R5-04	S45-R5-04	S45-R5-05	S45-R5-06	S45-R5-07
Sample ID		S45-R5-03	S45-R5-04	S45-R5-04D	S45-R5-05	S45-R5-06	S45-R5-07
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010
QC Type		SA	SA	DU	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG	100 U	98 U	100 U	97 U		
1,2-Dichlorobenzene	UG/KG	110 U	110 U	110 U	100 U		
1,3-Dichlorobenzene	UG/KG	100 U	94 U	97 U	93 U		
1,4-Dichlorobenzene	UG/KG	110 U	100 U	110 U	100 U		
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG	200 U	190 U	190 U	180 U		
2,4,6-Trichlorophenol	UG/KG	200 UJ	190 UJ	190 UJ	180 UJ		
2,4-Dichlorophenol	UG/KG	190 UJ	180 UJ	190 UJ	180 UJ		
2,4-Dimethylphenol	UG/KG	210 UJ	200 UJ	200 UJ	200 UJ		
2,4-Dinitrophenol	UG/KG	490 UJ	450 UJ	470 UJ	450 UJ		
2,4-Dinitrotoluene	UG/KG	110 U	100 U	110 U	100 U		
2,6-Dinitrotoluene	UG/KG	100 U	95 U	99 U	95 U		
2-Chloronaphthalene	UG/KG	110 UJ	100 UJ	110 UJ	100 UJ		
2-Chlorophenol	UG/KG	210 UJ	200 UJ	200 UJ	200 UJ		
2-Methylnaphthalene	UG/KG	120 U	110 U	110 U	110 U		
2-Methylphenol	UG/KG	260 UJ	240 UJ	250 UJ	240 UJ		
2-Nitroaniline	UG/KG	97 U	90 U	94 U	90 U		
2-Nitrophenol	UG/KG	220 UJ	200 UJ	210 UJ	200 UJ		
3 or 4-Methylphenol	UG/KG	240 UJ	220 UJ	230 UJ	220 UJ		
3,3'-Dichlorobenzidine	UG/KG	150 UJ	140 UJ	140 UJ	140 UJ		
3-Nitroaniline	UG/KG	120 UJ	110 UJ	120 UJ	110 UJ		
4,6-Dinitro-2-methylphenol	UG/KG	440 U	410 U	420 U	400 U		
4-Bromophenyl phenyl ether	UG/KG	110 U	100 U	110 U	100 U		
4-Chloro-3-methylphenol	UG/KG	220 U	200 U	210 U	200 U		
4-Chloroaniline	UG/KG	150 UJ	140 UJ	150 UJ	140 UJ		
4-Chlorophenyl phenyl ether	UG/KG	100 U	94 U	97 U	93 U		
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG	170 UJ	160 UJ	170 UJ	160 UJ		
4-Nitrophenol	UG/KG	400 U	370 U	380 U	370 U		

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R5-03	S45-R5-04	S45-R5-04	S45-R5-05	S45-R5-06	S45-R5-07
Sample ID		S45-R5-03	S45-R5-04	S45-R5-04D	S45-R5-05	S45-R5-06	S45-R5-07
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010
QC Type		SA	SA	DU	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG	84 U	78 U	81 U	78 U		
Acenaphthylene	UG/KG	91 U	84 U	87 U	84 U		
Anthracene	UG/KG	110 U	100 U	100 U	100 U		
Benzo(a)anthracene	UG/KG	110 U	100 U	110 U	100 U		
Benzo(a)pyrene	UG/KG	120 U	110 U	120 U	110 U		
Benzo(b)fluoranthene	UG/KG	170 U	160 U	170 U	160 U		
Benzo(ghi)perylene	UG/KG	130 U	120 U	130 U	120 U		
Benzo(k)fluoranthene	UG/KG	110 U	100 U	100 U	99 U		
Bis(2-Chloroethoxy)methane	UG/KG	120 UJ	120 UJ	120 UJ	120 UJ		
Bis(2-Chloroethyl)ether	UG/KG	100 U	98 U	100 U	97 U		
Bis(2-Chloroisopropyl)ether	UG/KG	120 U	110 U	110 U	110 U		
Bis(2-Ethylhexyl)phthalate	UG/KG	130 U	120 U	120 U	120 U		
Butylbenzylphthalate	UG/KG	120 U	110 U	120 U	110 U		
Carbazole	UG/KG	140 U	130 U	140 U	130 U		
Chrysene	UG/KG	120 U	110 U	120 U	110 U		
Dibenz(a,h)anthracene	UG/KG	170 U	150 U	160 U	150 U		
Dibenzofuran	UG/KG	100 U	95 U	99 U	95 U		
Diethyl phthalate	UG/KG	100 U	96 U	100 U	96 U		
Dimethylphthalate	UG/KG	100 U	94 U	97 U	93 U		
Di-n-butylphthalate	UG/KG	130 U	120 U	130 U	120 U		
Di-n-octylphthalate	UG/KG	270 U	250 U	260 U	250 U		
Fluoranthene	UG/KG	140 U	130 U	130 U	130 U		
Fluorene	UG/KG	100 U	98 U	100 U	97 U		
Hexachlorobenzene	UG/KG	110 U	99 U	100 U	98 U		
Hexachlorobutadiene	UG/KG	110 U	100 U	100 U	99 U		
Hexachlorocyclopentadiene	UG/KG	110 UJ	99 UJ	100 UJ	98 UJ		
Hexachloroethane	UG/KG	120 U	120 U	120 U	120 U		
Indeno(1,2,3-cd)pyrene	UG/KG	160 U	150 U	150 U	150 U		
Isophorone	UG/KG	97 U	90 U	94 U	90 U		
Naphthalene	UG/KG	110 U	100 U	110 U	100 U		
Nitrobenzene	UG/KG	120 U	110 U	110 U	110 U		
N-Nitrosodiphenylamine	UG/KG	280 UJ	260 UJ	270 UJ	260 UJ		
N-Nitrosodipropylamine	UG/KG	110 U	100 U	100 U	99 U		
Pentachlorophenol	UG/KG	310 UJ	280 UJ	300 UJ	280 UJ		
Phenanthrene	UG/KG	110 U	100 U	100 U	99 U		
Phenol	UG/KG	200 U	190 U	190 U	190 U		
Pyrene	UG/KG	130 U	120 U	130 U	120 U		
Herbicides							
2,4,5-T	UG/KG	21 U	20 U	19 U	18 U		
2,4,5-TP/Silvex	UG/KG	17 U	16 U	15 U	14 U		
2,4-D	UG/KG	43 U	41 U	38 U	37 U		
2,4-DB	UG/KG	31 U	30 U	28 U	27 U		
Dalapon	UG/KG	11 U	10 U	9.8 U	9.5 U		
Dicamba	UG/KG	15 U	14 U	13 U	13 U		
Dichloroprop	UG/KG	25 U	24 U	22 U	22 U		
Dinoseb	UG/KG	3.4 UJ	3.3 UJ	3 UJ	3 UJ		
MCPA	UG/KG	3,100 U	3,000 U	2,800 U	2,700 U		
MCPP	UG/KG	2,900 U	2,800 U	2,600 U	2,500 U		
Explosives							
1,3,5-Trinitrobenzene	UG/KG	8 U	7.4 U	7.5 U	7.3 U		
1,3-Dinitrobenzene	UG/KG	7.4 U	6.8 U	6.9 U	6.7 U		
2,4,6-Trinitrotoluene	UG/KG	8 U	7.4 U	7.5 U	470		
2,4-Dinitrotoluene	UG/KG	18 U	16 U	17 U	840		
2,6-Dinitrotoluene	UG/KG	32 U	30 U	30 U	29 U		
2-amino-4,6-Dinitrotoluene	UG/KG	25 U	23 U	23 U	23 U		
2-Nitrotoluene	UG/KG	14 U	13 U	13 U	13 U		
3,5-Dinitroaniline	UG/KG	4.2 U	3.9 U	3.9 U	3.8 U		
3-Nitrotoluene	UG/KG	9.5 UJ	8.7 UJ	8.8 UJ	8.6 UJ		
4-amino-2,6-Dinitrotoluene	UG/KG	20 U	19 U	19 U	18 U		
4-Nitrotoluene	UG/KG	32 U	30 U	30 U	29 U		
HMX	UG/KG	10 U	9.5 U	9.6 U	9.3 U		
Nitrobenzene	UG/KG	26 U	24 U	24 U	24 U		
Nitroglycerine	UG/KG	150 U	140 U	140 U	130 U		
Pentaerythritol Tetranitrate	UG/KG	290 U	260 U	270 U	260 U		
RDX	UG/KG	8.2 U	7.5 U	7.6 U	7.4 U		
Tetryl	UG/KG	6.5 UJ	6 UJ	6 UJ	5.9 UJ		

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R5-03	S45-R5-04	S45-R5-04	S45-R5-05	S45-R5-06	S45-R5-07
Sample ID		S45-R5-03	S45-R5-04	S45-R5-04D	S45-R5-05	S45-R5-06	S45-R5-07
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6
Sample Date		3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010	3/16/2010
QC Type		SA	SA	DU	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	**Unit**	**Value Qual**	**Value Qual**	**Value Qual**	**Value Qual**	**Value Qual**	**Value Qual**
Pesticides/PCBs							
Aroclor-1016	UG/KG	8.3 U	7.1 U	7.7 U	7.2 U		
Aroclor-1221	UG/KG	19 U	17 U	18 U	17 U		
Aroclor-1232	UG/KG	13 U	11 U	12 U	11 U		
Aroclor-1242	UG/KG	8 U	6.9 U	7.4 U	6.9 U		
Aroclor-1248	UG/KG	8.4 U	7.3 U	7.8 U	7.3 U		
Aroclor-1254	UG/KG	6.5 U	5.6 U	6 U	5.6 U		
Aroclor-1260	UG/KG	8.3 U	7.1 U	7.7 U	7.2 U		
4,4'-DDD	UG/KG	0.28 U	0.24 U	0.26 U	0.24 U		
4,4'-DDE	UG/KG	1.7 J	0.23 U	0.24 U	0.85 J		
4,4'-DDT	UG/KG	1.2 J	0.37 U	0.4 U	0.37 U		
Aldrin	UG/KG	0.38 U	0.33 U	0.36 U	0.34 U		
Alpha-BHC	UG/KG	0.47 U	0.4 U	0.44 U	0.41 U		
Alpha-Chlordane	UG/KG	0.29 U	0.25 U	0.27 U	0.25 U		
Beta-BHC	UG/KG	0.45 U	0.39 U	0.42 U	0.4 U		
Delta-BHC	UG/KG	0.44 U	0.38 U	0.41 U	0.38 U		
Dieldrin	UG/KG	1.1 J	0.26 U	0.28 U	0.79 J		
Endosulfan I	UG/KG	1.3 JN	0.28 UJ	55 J	0.29 UJ		
Endosulfan II	UG/KG	0.47 UJ	0.4 UJ	0.44 UJ	0.41 UJ		
Endosulfan sulfate	UG/KG	0.8 U	0.69 U	0.74 U	0.69 U		
Endrin	UG/KG	1.2 U	1 U	1.1 U	1 U		
Endrin aldehyde	UG/KG	0.68 UJ	0.58 UJ	0.63 UJ	0.59 UJ		
Endrin ketone	UG/KG	0.55 U	0.48 U	0.51 U	0.48 U		
Gamma-BHC/Lindane	UG/KG	0.37 U	0.32 U	0.35 U	0.32 U		
Gamma-Chlordane	UG/KG	0.32 U	0.27 U	0.3 U	0.28 U		
Heptachlor	UG/KG	0.4 U	0.34 U	0.37 U	0.35 U		
Heptachlor epoxide	UG/KG	0.3 U	0.26 U	0.28 U	0.26 U		
Methoxychlor	UG/KG	0.69 U	0.6 U	0.64 U	0.6 U		
Toxaphene	UG/KG	9.6 U	8.3 U	9 U	8.4 U		
Inorganics							
Aluminum	MG/KG	18,900	18,100	18,800	18,700	21,600	16,100
Antimony	MG/KG	0.15 U	0.09 UJ	0.12 UJ	0.11 U	0.11 U	0.18 J
Arsenic	MG/KG	5.4	5.5	7	5.2	5.2	5.1
Barium	MG/KG	177 J	106 J	114 J	165 J	148 J	111 J
Beryllium	MG/KG	0.85 J	0.9 J	0.95 J	0.79 J	0.86 J	0.75 J
Cadmium	MG/KG	6.4	0.86 U	0.46 J	5.1	0.62 J	8.3
Calcium	MG/KG	20,600 J	3,290 J	3,490 J	29,300 J	5,100 J	41,300 J
Chromium	MG/KG	29.7 J	26.4 J	28 J	26.7 J	28.8 J	25.6 J
Cobalt	MG/KG	13.4 J	11 J	16.4 J	10 J	9.2 J	11.8 J
Copper	MG/KG	350	31.5	33.6	219	44.4	210
Cyanide	MG/KG						
Iron	MG/KG	25,400 J	25,800 J	30,400 J	25,400 J	25,200 J	26,800 J
Lead	MG/KG	60	11.9 J	15.4 J	42.9	12.9	44.6
Magnesium	MG/KG	7,260 J	4,980 J	5,330 J	7,140 J	5,740 J	8,440 J
Manganese	MG/KG	662 J	336 J	787 J	489 J	395 J	591 J
Nickel	MG/KG	40.1 J	43 J	56 J	33.4 J	29.8 J	38.9 J
Potassium	MG/KG	3,060 J	2,670 J	2,960 J	3,220 J	4,140 J	2,640 J
Selenium	MG/KG	0.33 U	0.19 U	0.26 U	0.24 U	0.25 U	0.25 U
Silver	MG/KG	2.6	0.06 U	0.08 U	1.7 U	1.7 U	1.7 U
Sodium	MG/KG	103	86 U	70.2 J	127	110 U	132
Thallium	MG/KG	0.14 U	0.08 U	0.11 U	0.1 U	0.11 U	0.1 U
Vanadium	MG/KG	31.8 J	29.7 J	31.2 J	30.1 J	37.3 J	25 J
Zinc	MG/KG	304 J	80.2 J	83.9 J	360 J	89.5 J	230 J
Mercury	MG/KG	4.7	0.03 J	0.039 U	1.3	0.23	1

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Sample ID		S45-R5-08	S45-TP-1-01	S45-TP-1-02	S45-TP-1-03	S45-TP-1-04	S45-TP-2-01
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0.2-0.6	0	2.5	5	7.5	0
Sample Date		3/16/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG		92 U				90 U
1,2-Dichlorobenzene	UG/KG		100 U				98 U
1,3-Dichlorobenzene	UG/KG		88 U				87 U
1,4-Dichlorobenzene	UG/KG		97 U				96 U
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG		180 U				170 U
2,4,6-Trichlorophenol	UG/KG		180 U				170 U
2,4-Dichlorophenol	UG/KG		170 U				170 U
2,4-Dimethylphenol	UG/KG		190 U				180 U
2,4-Dinitrophenol	UG/KG		430 U				420 U
2,4-Dinitrotoluene	UG/KG		380				94 U
2,6-Dinitrotoluene	UG/KG		90 U				88 U
2-Chloronaphthalene	UG/KG		99 U				97 U
2-Chlorophenol	UG/KG		180 U				180 U
2-Methylnaphthalene	UG/KG		100 U				100 U
2-Methylphenol	UG/KG		230 U				220 U
2-Nitroaniline	UG/KG		85 U				83 U
2-Nitrophenol	UG/KG		190 U				180 U
3 or 4-Methylphenol	UG/KG		210 U				210 U
3,3'-Dichlorobenzidine	UG/KG		130 U				130 U
3-Nitroaniline	UG/KG		110 U				100 U
4,6-Dinitro-2-methylphenol	UG/KG		380 U				370 U
4-Bromophenyl phenyl ether	UG/KG		96 U				94 U
4-Chloro-3-methylphenol	UG/KG		190 U				180 U
4-Chloroaniline	UG/KG		130 U				130 U
4-Chlorophenyl phenyl ether	UG/KG		88 U				87 U
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG		150 U				150 U
4-Nitrophenol	UG/KG		350 U				340 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R5-08		S45-TP-1-01		S45-TP-1-02		S45-TP-1-03		S45-TP-1-04		S45-TP-2-01	
Sample ID		S45-R5-08		S45-TP-1-01		S45-TP-1-02		S45-TP-1-03		S45-TP-1-04		S45-TP-2-01	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0		2.5		5		7.5		0	
Sample Date		3/16/2010		3/12/2010		3/12/2010		3/12/2010		3/12/2010		3/12/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Acenaphthene	UG/KG			74	U							72	U
Acenaphthylene	UG/KG			79	U							78	U
Anthracene	UG/KG			95	U							93	U
Benzo(a)anthracene	UG/KG			97	U							96	U
Benzo(a)pyrene	UG/KG			100	U							100	U
Benzo(b)fluoranthene	UG/KG			150	U							150	U
Benzo(ghi)perylene	UG/KG			120	UJ							120	UJ
Benzo(k)fluoranthene	UG/KG			94	U							92	U
Bis(2-Chloroethoxy)methane	UG/KG			110	U							110	U
Bis(2-Chloroethyl)ether	UG/KG			92	U							90	U
Bis(2-Chloroisopropyl)ether	UG/KG			100	U							99	U
Bis(2-Ethylhexyl)phthalate	UG/KG			110	U							110	U
Butylbenzylphthalate	UG/KG			100	U							100	U
Carbazole	UG/KG			120	U							120	U
Chrysene	UG/KG			110	U							100	U
Dibenz(a,h)anthracene	UG/KG			140	U							140	U
Dibenzofuran	UG/KG			90	U							88	U
Diethyl phthalate	UG/KG			91	U							89	U
Dimethylphthalate	UG/KG			88	U							87	U
Di-n-butylphthalate	UG/KG			410								110	U
Di-n-octylphthalate	UG/KG			240	U							230	U
Fluoranthene	UG/KG			120	U							120	U
Fluorene	UG/KG			92	U							90	U
Hexachlorobenzene	UG/KG			93	U							91	U
Hexachlorobutadiene	UG/KG			94	U							92	U
Hexachlorocyclopentadiene	UG/KG			93	U							91	U
Hexachloroethane	UG/KG			110	U							110	U
Indeno(1,2,3-cd)pyrene	UG/KG			140	U							140	U
Isophorone	UG/KG			85	U							83	U
Naphthalene	UG/KG			99	U							97	U
Nitrobenzene	UG/KG			100	U							100	U
N-Nitrosodiphenylamine	UG/KG			250	U							240	U
N-Nitrosodipropylamine	UG/KG			94	U							92	U
Pentachlorophenol	UG/KG			270	U							260	U
Phenanthrene	UG/KG			94	U							92	U
Phenol	UG/KG			180	U							170	U
Pyrene	UG/KG			110	U							110	U
Herbicides													
2,4,5-T	UG/KG			17	U							17	U
2,4,5-TP/Silvex	UG/KG			14	U							14	U
2,4-D	UG/KG			35	U							35	U
2,4-DB	UG/KG			25	U							26	U
Dalapon	UG/KG			9	U							9.1	U
Dicamba	UG/KG			12	U							12	U
Dichloroprop	UG/KG			20	U							21	U
Dinoseb	UG/KG			2.8	U							2.8	U
MCPA	UG/KG			2,500	U							2,600	U
MCPP	UG/KG			2,400	U							2,400	U
Explosives													
1,3,5-Trinitrobenzene	UG/KG			55	NJ							59	J
1,3-Dinitrobenzene	UG/KG			7.1	U							6.6	U
2,4,6-Trinitrotoluene	UG/KG			44	J							50	J
2,4-Dinitrotoluene	UG/KG			98	J							91	J
2,6-Dinitrotoluene	UG/KG			31	U							29	U
2-amino-4,6-Dinitrotoluene	UG/KG			170	J							190	J
2-Nitrotoluene	UG/KG			14	U							13	U
3,5-Dinitroaniline	UG/KG			4	U							3.8	U
3-Nitrotoluene	UG/KG			9.1	UJ							8.5	UJ
4-amino-2,6-Dinitrotoluene	UG/KG			180								200	
4-Nitrotoluene	UG/KG			31	U							29	U
HMX	UG/KG			97	J							160	
Nitrobenzene	UG/KG			25	U							24	U
Nitroglycerine	UG/KG			140	U							130	U
Pentaerythritol Tetranitrate	UG/KG			280	U							260	U
RDX	UG/KG			190								220	
Tetryl	UG/KG			6.2	U							5.8	U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		S45-R5-08		S45-TP-1-01		S45-TP-1-02		S45-TP-1-03		S45-TP-1-04		S45-TP-2-01	
Sample ID		S45-R5-08		S45-TP-1-01		S45-TP-1-02		S45-TP-1-03		S45-TP-1-04		S45-TP-2-01	
Matrix		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
Sample Depth Interval (FT)		0.2-0.6		0		2.5		5		7.5		0	
Sample Date		3/16/2010		3/12/2010		3/12/2010		3/12/2010		3/12/2010		3/12/2010	
QC Type		SA		SA		SA		SA		SA		SA	
Study ID		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest		OD Initial Invest	
Parameter	**Unit**	**Value**	**Qual**	**Value**	**Qual**	**Value**	**Qual**	**Value**	**Qual**	**Value**	**Qual**	**Value**	**Qual**
Pesticides/PCBs													
Aroclor-1016	UG/KG			6.9	U							6.7	U
Aroclor-1221	UG/KG			16	U							16	U
Aroclor-1232	UG/KG			11	U							10	U
Aroclor-1242	UG/KG			6.6	U							6.5	U
Aroclor-1248	UG/KG			7	U							6.8	U
Aroclor-1254	UG/KG			5.4	U							5.3	U
Aroclor-1260	UG/KG			6.9	U							6.7	U
4,4'-DDD	UG/KG			0.23	U							2.4	JN
4,4'-DDE	UG/KG			1.2	J							1.5	J
4,4'-DDT	UG/KG			1	J							2.2	JN
Aldrin	UG/KG			0.32	U							0.31	U
Alpha-BHC	UG/KG			0.39	U							0.38	U
Alpha-Chlordane	UG/KG			0.59	J							0.24	U
Beta-BHC	UG/KG			0.38	U							0.37	U
Delta-BHC	UG/KG			0.37	U							0.36	U
Dieldrin	UG/KG			0.25	U							1.2	J
Endosulfan I	UG/KG			0.8	J							1.3	J
Endosulfan II	UG/KG			0.39	U							0.38	U
Endosulfan sulfate	UG/KG			0.66	U							0.65	U
Endrin	UG/KG			0.97	U							3.6	J
Endrin aldehyde	UG/KG			0.56	U							0.55	U
Endrin ketone	UG/KG			0.46	U							0.45	U
Gamma-BHC/Lindane	UG/KG			0.31	U							0.3	U
Gamma-Chlordane	UG/KG			0.68	J							1.1	J
Heptachlor	UG/KG			0.33	U							0.32	U
Heptachlor epoxide	UG/KG			0.25	U							0.25	U
Methoxychlor	UG/KG			0.57	U							0.56	U
Toxaphene	UG/KG			8	U							7.8	U
Inorganics													
Aluminum	MG/KG	27,900		14,400		14,400		17,800		13,000		16,700	
Antimony	MG/KG	2.8	J	0.14	UJ	0.63	J	0.2	UJ	0.13	UJ	0.21	UJ
Arsenic	MG/KG	6.4		5.4		8.7		7.9		4.2		5.5	
Barium	MG/KG	229	J	134		101		171		71.2		146	
Beryllium	MG/KG	1.2	J	0.67		0.62		0.78		0.63		0.79	
Cadmium	MG/KG	1.1		9		13.4		8.7		0.04	J	6.8	
Calcium	MG/KG	14,800	J	34,600		62,400		25,700		53,200		25,200	
Chromium	MG/KG	33.3	J	25.4		35		39.2		23.5		27.9	
Cobalt	MG/KG	12.5	J	11.8		12.9		13.6		13.3		12.3	
Copper	MG/KG	142		853		7,310		882		44.4		365	
Cyanide	MG/KG												
Iron	MG/KG	30,600	J	24,800		60,900		37,600		22,100		30,200	
Lead	MG/KG	998	J	54.3		22.3		63.8		15.9		54.6	
Magnesium	MG/KG	8,740	J	8,140		9,200		7,030		10,800		6,780	
Manganese	MG/KG	506	J	519		574		635		409		572	
Nickel	MG/KG	38.6	J	37.7		54		43.5		45.4		40.7	
Potassium	MG/KG	4,880	J	1,820	J	2,180	J	2,700	J	2,240	J	2,090	J
Selenium	MG/KG	0.21	U	0.32	U	0.59	U	0.43	U	0.28	U	0.46	U
Silver	MG/KG	0.06	U	8.7		53.7		7.3		0.14	J	3	J
Sodium	MG/KG	113		113		151		122		120		88.2	J
Thallium	MG/KG	0.09	U	0.27	J	0.25	U	0.18	U	0.12	U	0.19	U
Vanadium	MG/KG	40	J	23.8		22.3		29.8		21.3		26.9	
Zinc	MG/KG	153	J	272		150		335		84.4		336	
Mercury	MG/KG	0.17		2.9		4.3		5.2		0.02	J	2.7	

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01
Sample ID		S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01D
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		2.5	5	7.5	10	0	0
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	DU
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG					83 U	89 U
1,2-Dichlorobenzene	UG/KG					90 U	97 U
1,3-Dichlorobenzene	UG/KG					80 U	86 U
1,4-Dichlorobenzene	UG/KG					88 U	95 U
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG					160 U	170 U
2,4,6-Trichlorophenol	UG/KG					160 U	170 U
2,4-Dichlorophenol	UG/KG					150 U	160 U
2,4-Dimethylphenol	UG/KG					170 U	180 U
2,4-Dinitrophenol	UG/KG					390 U	410 U
2,4-Dinitrotoluene	UG/KG					87 U	94 U
2,6-Dinitrotoluene	UG/KG					81 U	87 U
2-Chloronaphthalene	UG/KG					89 U	96 U
2-Chlorophenol	UG/KG					170 U	180 U
2-Methylnaphthalene	UG/KG					94 U	100 U
2-Methylphenol	UG/KG					200 U	220 U
2-Nitroaniline	UG/KG					77 U	82 U
2-Nitrophenol	UG/KG					170 U	180 U
3 or 4-Methylphenol	UG/KG					190 U	200 U
3,3'-Dichlorobenzidine	UG/KG					120 U	120 U
3-Nitroaniline	UG/KG					96 U	100 U
4,6-Dinitro-2-methylphenol	UG/KG					340 U	370 U
4-Bromophenyl phenyl ether	UG/KG					87 U	94 U
4-Chloro-3-methylphenol	UG/KG					170 U	180 U
4-Chloroaniline	UG/KG					120 U	130 U
4-Chlorophenyl phenyl ether	UG/KG					80 U	86 U
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG					140 U	150 U
4-Nitrophenol	UG/KG					320 U	340 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01
Sample ID		S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01D
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		2.5	5	7.5	10	0	0
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	DU
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG					67 U	72 U
Acenaphthylene	UG/KG					72 U	77 U
Anthracene	UG/KG					86 U	92 U
Benzo(a)anthracene	UG/KG					88 U	95 U
Benzo(a)pyrene	UG/KG					95 U	100 U
Benzo(b)fluoranthene	UG/KG					140 U	150 U
Benzo(ghi)perylene	UG/KG					110 UJ	110 UJ
Benzo(k)fluoranthene	UG/KG					85 U	91 U
Bis(2-Chloroethoxy)methane	UG/KG					98 U	100 U
Bis(2-Chloroethyl)ether	UG/KG					83 U	89 U
Bis(2-Chloroisopropyl)ether	UG/KG					91 U	98 U
Bis(2-Ethylhexyl)phthalate	UG/KG					100 U	110 U
Butylbenzylphthalate	UG/KG					95 U	100 U
Carbazole	UG/KG					110 U	120 U
Chrysene	UG/KG					97 U	100 U
Dibenz(a,h)anthracene	UG/KG					130 U	140 U
Dibenzofuran	UG/KG					81 U	87 U
Diethyl phthalate	UG/KG					82 U	88 U
Dimethylphthalate	UG/KG					80 U	86 U
Di-n-butylphthalate	UG/KG					100 U	110 U
Di-n-octylphthalate	UG/KG					220 U	230 U
Fluoranthene	UG/KG					110 U	120 U
Fluorene	UG/KG					83 U	89 U
Hexachlorobenzene	UG/KG					110 J	90 UJ
Hexachlorobutadiene	UG/KG					85 U	91 U
Hexachlorocyclopentadiene	UG/KG					84 U	90 U
Hexachloroethane	UG/KG					98 U	100 U
Indeno(1,2,3-cd)pyrene	UG/KG					120 U	130 U
Isophorone	UG/KG					77 U	82 U
Naphthalene	UG/KG					89 U	96 U
Nitrobenzene	UG/KG					93 U	100 U
N-Nitrosodiphenylamine	UG/KG					220 U	240 U
N-Nitrosodipropylamine	UG/KG					85 U	91 U
Pentachlorophenol	UG/KG					240 U	260 U
Phenanthrene	UG/KG					85 U	91 U
Phenol	UG/KG					160 U	170 U
Pyrene	UG/KG					100 U	110 U
Herbicides							
2,4,5-T	UG/KG					16 U	18 U
2,4,5-TP/Silvex	UG/KG					13 U	14 U
2,4-D	UG/KG					33 U	37 U
2,4-DB	UG/KG					24 U	27 U
Dalapon	UG/KG					8.6 U	9.5 U
Dicamba	UG/KG					11 U	13 U
Dichloroprop	UG/KG					19 U	22 U
Dinoseb	UG/KG					2.7 U	3 U
MCPA	UG/KG					2,400 U	2,700 U
MCPP	UG/KG					2,300 U	2,500 U
Explosives							
1,3,5-Trinitrobenzene	UG/KG					7.1 UJ	50 NJ
1,3-Dinitrobenzene	UG/KG					6.5 U	6 U
2,4,6-Trinitrotoluene	UG/KG					68 J	49 J
2,4-Dinitrotoluene	UG/KG					120	57 J
2,6-Dinitrotoluene	UG/KG					28 U	26 U
2-amino-4,6-Dinitrotoluene	UG/KG					330	110 J
2-Nitrotoluene	UG/KG					13 U	12 U
3,5-Dinitroaniline	UG/KG					3.7 U	3.4 U
3-Nitrotoluene	UG/KG					8.3 UJ	7.6 UJ
4-amino-2,6-Dinitrotoluene	UG/KG					500	150
4-Nitrotoluene	UG/KG					28 U	26 U
HMX	UG/KG					9.1 UJ	43 J
Nitrobenzene	UG/KG					23 U	21 U
Nitroglycerine	UG/KG					130 U	120 U
Pentaerythritol Tetranitrate	UG/KG					250 U	230 U
RDX	UG/KG					230 NJ	75 J
Tetryl	UG/KG					5.7 U	5.2 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01
Sample ID		S45-TP-2-02	S45-TP-2-03	S45-TP-2-04	S45-TP-2-05	S45-TP-3-01	S45-TP-3-01D
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		2.5	5	7.5	10	0	0
Sample Date		3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	DU
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG					5.9 U	6.9 U
Aroclor-1221	UG/KG					14 U	16 U
Aroclor-1232	UG/KG					9.2 U	11 U
Aroclor-1242	UG/KG					5.7 U	6.7 U
Aroclor-1248	UG/KG					6 U	7 U
Aroclor-1254	UG/KG					4.6 U	5.4 U
Aroclor-1260	UG/KG					5.9 U	6.9 U
4,4'-DDD	UG/KG					0.2 U	0.23 U
4,4'-DDE	UG/KG					1.1 J	0.67 J
4,4'-DDT	UG/KG					0.31 U	0.68 J
Aldrin	UG/KG					0.28 U	0.32 U
Alpha-BHC	UG/KG					0.34 U	0.39 U
Alpha-Chlordane	UG/KG					0.21 U	0.24 U
Beta-BHC	UG/KG					0.33 U	0.38 U
Delta-BHC	UG/KG					0.32 U	0.37 U
Dieldrin	UG/KG					0.22 U	0.81 J
Endosulfan I	UG/KG					1.2 J	0.77 J
Endosulfan II	UG/KG					0.34 U	0.39 U
Endosulfan sulfate	UG/KG					0.57 U	0.67 U
Endrin	UG/KG					0.84 U	0.98 U
Endrin aldehyde	UG/KG					0.48 U	0.56 U
Endrin ketone	UG/KG					0.4 U	0.46 U
Gamma-BHC/Lindane	UG/KG					0.27 U	0.31 U
Gamma-Chlordane	UG/KG					0.23 U	0.26 U
Heptachlor	UG/KG					0.29 U	0.33 U
Heptachlor epoxide	UG/KG					0.22 U	0.25 U
Methoxychlor	UG/KG					0.5 U	0.58 U
Toxaphene	UG/KG					6.9 U	8 U
Inorganics							
Aluminum	MG/KG	16,400	12,500	16,500	12,500	11,900	17,100
Antimony	MG/KG	0.2 UJ	1.5 J	0.29 J	0.38 J	0.15 UJ	0.2 UJ
Arsenic	MG/KG	5.5	4.2	4.8	5.8	4.3	5.1
Barium	MG/KG	126	190	227	191	159	187
Beryllium	MG/KG	0.79	0.55	0.73	0.6	0.53	0.76
Cadmium	MG/KG	3.5	4.6	7.6	6.1	5.6	7.7
Calcium	MG/KG	28,900	101,000	29,500	30,900	24,400	28,100
Chromium	MG/KG	26.2	21.3	26.7	19.7	20.9	27.3
Cobalt	MG/KG	12.5	10	11.3	9.6	9.3	11.4
Copper	MG/KG	132	165	2,490	172	143	330
Cyanide	MG/KG						
Iron	MG/KG	27,800	20,300	25,600	23,000	22,200	25,600
Lead	MG/KG	33.4	62.8	91	83.6	86.3	70.9
Magnesium	MG/KG	7,010	7,450	7,380	6,020	6,170	7,980
Manganese	MG/KG	616	727	407	389	423	515
Nickel	MG/KG	37.1	31	38.2	30	30.6	37.7
Potassium	MG/KG	2,140 J	1,780 J	2,400 J	1,780 J	1,700 J	2,680 J
Selenium	MG/KG	0.43 U	0.32 U	0.4 U	0.23 U	0.33 U	0.45 U
Silver	MG/KG	0.72 J	0.31 J	0.63 J	0.78 J	0.56 J	2.2 J
Sodium	MG/KG	199	213	189	199	146	211
Thallium	MG/KG	0.18 U	0.14 U	0.17 U	0.25 J	0.14 U	0.19 U
Vanadium	MG/KG	26.5	20.8	26.9	20.6	20.8	28.5
Zinc	MG/KG	198	463	1,470	535	387	434
Mercury	MG/KG	1.1	6	9.1	7.6	7	6.8

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Sample ID		S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		2.5	5	7.5	10	0	2.5
Sample Date		3/15/2010	3/15/2010	3/15/2010	3/15/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG						
1,1,2,2-Tetrachloroethane	UG/KG						
1,1,2-Trichloroethane	UG/KG						
1,1-Dichloroethane	UG/KG						
1,1-Dichloroethene	UG/KG						
1,2-Dichloroethane	UG/KG						
1,2-Dichloroethene (total)	UG/KG						
1,2-Dichloropropane	UG/KG						
Acetone	UG/KG						
Benzene	UG/KG						
Bromodichloromethane	UG/KG						
Bromoform	UG/KG						
Carbon disulfide	UG/KG						
Carbon tetrachloride	UG/KG						
Chlorobenzene	UG/KG						
Chlorodibromomethane	UG/KG						
Chloroethane	UG/KG						
Chloroform	UG/KG						
Cis-1,3-Dichloropropene	UG/KG						
Ethyl benzene	UG/KG						
Methyl bromide	UG/KG						
Methyl butyl ketone	UG/KG						
Methyl chloride	UG/KG						
Methyl ethyl ketone	UG/KG						
Methyl isobutyl ketone	UG/KG						
Methylene chloride	UG/KG						
Styrene	UG/KG						
Tetrachloroethene	UG/KG						
Toluene	UG/KG						
Total Xylenes	UG/KG						
Trans-1,3-Dichloropropene	UG/KG						
Trichloroethene	UG/KG						
Vinyl chloride	UG/KG						
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG					94 U	
1,2-Dichlorobenzene	UG/KG					100 U	
1,3-Dichlorobenzene	UG/KG					90 U	
1,4-Dichlorobenzene	UG/KG					100 U	
2,2'-oxybis(1-Chloropropane)	UG/KG						
2,4,5-Trichlorophenol	UG/KG					180 U	
2,4,6-Trichlorophenol	UG/KG					180 U	
2,4-Dichlorophenol	UG/KG					170 U	
2,4-Dimethylphenol	UG/KG					190 U	
2,4-Dinitrophenol	UG/KG					440 U	
2,4-Dinitrotoluene	UG/KG					2,500	
2,6-Dinitrotoluene	UG/KG					92 U	
2-Chloronaphthalene	UG/KG					100 U	
2-Chlorophenol	UG/KG					190 U	
2-Methylnaphthalene	UG/KG					110 U	
2-Methylphenol	UG/KG					230 U	
2-Nitroaniline	UG/KG					87 U	
2-Nitrophenol	UG/KG					190 U	
3 or 4-Methylphenol	UG/KG					220 U	
3,3'-Dichlorobenzidine	UG/KG					130 U	
3-Nitroaniline	UG/KG					110 U	
4,6-Dinitro-2-methylphenol	UG/KG					390 U	
4-Bromophenyl phenyl ether	UG/KG					99 U	
4-Chloro-3-methylphenol	UG/KG					190 U	
4-Chloroaniline	UG/KG					140 U	
4-Chlorophenyl phenyl ether	UG/KG					90 U	
4-Methylphenol	UG/KG						
4-Nitroaniline	UG/KG					160 U	
4-Nitrophenol	UG/KG					360 U	

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Sample ID		S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		2.5	5	7.5	10	0	2.5
Sample Date		3/15/2010	3/15/2010	3/15/2010	3/15/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG					75 U	
Acenaphthylene	UG/KG					81 U	
Anthracene	UG/KG					97 U	
Benzo(a)anthracene	UG/KG					100 U	
Benzo(a)pyrene	UG/KG					110 U	
Benzo(b)fluoranthene	UG/KG					160 U	
Benzo(ghi)perylene	UG/KG					120 UJ	
Benzo(k)fluoranthene	UG/KG					96 U	
Bis(2-Chloroethoxy)methane	UG/KG					110 U	
Bis(2-Chloroethyl)ether	UG/KG					94 U	
Bis(2-Chloroisopropyl)ether	UG/KG					100 U	
Bis(2-Ethylhexyl)phthalate	UG/KG					110 U	
Butylbenzylphthalate	UG/KG					110 U	
Carbazole	UG/KG					130 U	
Chrysene	UG/KG					110 U	
Dibenz(a,h)anthracene	UG/KG					150 U	
Dibenzofuran	UG/KG					92 U	
Diethyl phthalate	UG/KG					93 U	
Dimethylphthalate	UG/KG					90 U	
Di-n-butylphthalate	UG/KG					2,600	
Di-n-octylphthalate	UG/KG					240 U	
Fluoranthene	UG/KG					120 U	
Fluorene	UG/KG					94 U	
Hexachlorobenzene	UG/KG					95 U	
Hexachlorobutadiene	UG/KG					96 U	
Hexachlorocyclopentadiene	UG/KG					95 U	
Hexachloroethane	UG/KG					110 U	
Indeno(1,2,3-cd)pyrene	UG/KG					140 U	
Isophorone	UG/KG					87 U	
Naphthalene	UG/KG					100 U	
Nitrobenzene	UG/KG					100 U	
N-Nitrosodiphenylamine	UG/KG					320 J	
N-Nitrosodipropylamine	UG/KG					96 U	
Pentachlorophenol	UG/KG					280 U	
Phenanthrene	UG/KG					96 U	
Phenol	UG/KG					180 U	
Pyrene	UG/KG					120 U	
Herbicides							
2,4,5-T	UG/KG					18 U	
2,4,5-TP/Silvex	UG/KG					14 U	
2,4-D	UG/KG					36 U	
2,4-DB	UG/KG					26 U	
Dalapon	UG/KG					9.2 U	
Dicamba	UG/KG					12 U	
Dichloroprop	UG/KG					21 U	
Dinoseb	UG/KG					2.9 U	
MCPA	UG/KG					2,600 U	
MCPP	UG/KG					2,400 U	
Explosives							
1,3,5-Trinitrobenzene	UG/KG					45 J	
1,3-Dinitrobenzene	UG/KG					6.4 U	
2,4,6-Trinitrotoluene	UG/KG					37 J	
2,4-Dinitrotoluene	UG/KG					86 J	
2,6-Dinitrotoluene	UG/KG					28 U	
2-amino-4,6-Dinitrotoluene	UG/KG					150 J	
2-Nitrotoluene	UG/KG					12 U	
3,5-Dinitroaniline	UG/KG					3.6 U	
3-Nitrotoluene	UG/KG					8.2 UJ	
4-amino-2,6-Dinitrotoluene	UG/KG					150 J	
4-Nitrotoluene	UG/KG					28 U	
HMX	UG/KG					180	
Nitrobenzene	UG/KG					23 U	
Nitroglycerine	UG/KG					130 U	
Pentaerythritol Tetranitrate	UG/KG					250 U	
RDX	UG/KG					310	
Tetryl	UG/KG					5.6 U	

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Sample ID		S45-TP-3-02	S45-TP-3-03	S45-TP-3-04	S45-TP-3-05	S45-TP-4-01	S45-TP-4-02
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		2.5	5	7.5	10	0	2.5
Sample Date		3/15/2010	3/15/2010	3/15/2010	3/15/2010	3/12/2010	3/12/2010
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest	OD Initial Invest
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG					7.1 U	
Aroclor-1221	UG/KG					16 U	
Aroclor-1232	UG/KG					11 U	
Aroclor-1242	UG/KG					6.8 U	
Aroclor-1248	UG/KG					7.2 U	
Aroclor-1254	UG/KG					5.5 U	
Aroclor-1260	UG/KG					7.1 U	
4,4'-DDD	UG/KG					0.24 U	
4,4'-DDE	UG/KG					0.9 J	
4,4'-DDT	UG/KG					0.77 J	
Aldrin	UG/KG					0.33 U	
Alpha-BHC	UG/KG					0.4 U	
Alpha-Chlordane	UG/KG					0.25 U	
Beta-BHC	UG/KG					0.39 U	
Delta-BHC	UG/KG					0.38 U	
Dieldrin	UG/KG					0.79 J	
Endosulfan I	UG/KG					0.74 J	
Endosulfan II	UG/KG					0.4 U	
Endosulfan sulfate	UG/KG					0.68 U	
Endrin	UG/KG					1 U	
Endrin aldehyde	UG/KG					0.58 U	
Endrin ketone	UG/KG					0.47 U	
Gamma-BHC/Lindane	UG/KG					0.32 U	
Gamma-Chlordane	UG/KG					0.27 U	
Heptachlor	UG/KG					0.34 U	
Heptachlor epoxide	UG/KG					0.26 U	
Methoxychlor	UG/KG					0.59 U	
Toxaphene	UG/KG					8.2 U	
Inorganics							
Aluminum	MG/KG	16,500 J	21,700 J	17,400 J	14,400 J	17,800	15,000
Antimony	MG/KG	0.2 UJ	5.1 J	0.38 J	0.69 U	0.12 UJ	0.58 J
Arsenic	MG/KG	4.7 J	4.6 J	4.6 J	3.9 J	5	5.7
Barium	MG/KG	158 J	173 J	154 J	126 J	170	153
Beryllium	MG/KG	0.75 J	0.7 J	0.74 J	0.62 J	0.79	0.7
Cadmium	MG/KG	7.9 J	6.9 J	6.1 J	2.8 J	7.3	8.1
Calcium	MG/KG	23,000 J	34,100 J	28,800 J	37,700 J	27,600	30,900
Chromium	MG/KG	28.1 J	26.7 J	26 J	22.8 J	27.4	25
Cobalt	MG/KG	12.1 J	9.2 J	9.4 J	10 J	10.8	11.3
Copper	MG/KG	378 J	716 J	311 J	266 J	343	416
Cyanide	MG/KG						
Iron	MG/KG	26,900 J	23,400 J	24,300 J	21,500 J	27,500	24,800
Lead	MG/KG	58.3 J	153 J	45.7 J	42.7 J	64.9	57.4
Magnesium	MG/KG	7,310 J	7,810 J	9,350 J	8,470 J	7,170	12,100
Manganese	MG/KG	580 J	566 J	502 J	420 J	531	577
Nickel	MG/KG	40.8 J	39 J	33.9 J	34.8 J	37.9	35.8
Potassium	MG/KG	2,310 J	3,220 J	3,510 J	2,590 J	2,710 J	2,010 J
Selenium	MG/KG	0.44 UJ	0.22 UJ	0.21 UJ	0.19 UJ	0.26 U	0.41 U
Silver	MG/KG	2.5 J	1.5 U	2.9 J	1.3 U	2.4	3.6
Sodium	MG/KG	101 J	149 J	101 J	137 J	198	195
Thallium	MG/KG	0.18 UJ	0.09 UJ	0.09 UJ	0.08 UJ	0.11 U	0.17 U
Vanadium	MG/KG	27.6 J	29 J	28.3 J	23 J	28.1	25.7
Zinc	MG/KG	315 J	585 J	294 J	241 J	317	304
Mercury	MG/KG	2.6 J	8 J	3.2 J	3.2 J	2.4	4.4

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Sample ID		S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		5	7.5	10	0-0.2	0-0.2	0-0.2
Sample Date		3/12/2010	3/12/2010	3/12/2010	10/25/1993	10/25/1993	10/25/1993
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG				12 U	11 U	12 U
1,1,2,2-Tetrachloroethane	UG/KG				12 U	11 U	12 U
1,1,2-Trichloroethane	UG/KG				12 U	11 U	12 U
1,1-Dichloroethane	UG/KG				12 U	11 U	12 U
1,1-Dichloroethene	UG/KG				12 U	11 U	12 U
1,2-Dichloroethane	UG/KG				12 U	11 U	12 U
1,2-Dichloroethene (total)	UG/KG				12 U	11 U	12 U
1,2-Dichloropropane	UG/KG				12 U	11 U	12 U
Acetone	UG/KG				12 U	11 U	12 U
Benzene	UG/KG				12 U	11 U	12 U
Bromodichloromethane	UG/KG				12 U	11 U	12 U
Bromoform	UG/KG				12 U	11 U	12 U
Carbon disulfide	UG/KG				12 U	11 U	12 U
Carbon tetrachloride	UG/KG				12 U	11 U	12 U
Chlorobenzene	UG/KG				12 U	11 U	12 U
Chlorodibromomethane	UG/KG				12 U	11 U	12 U
Chloroethane	UG/KG				12 U	11 U	12 U
Chloroform	UG/KG				12 U	11 U	12 U
Cis-1,3-Dichloropropene	UG/KG				12 U	11 U	12 U
Ethyl benzene	UG/KG				12 U	11 U	12 U
Methyl bromide	UG/KG				12 U	11 U	12 U
Methyl butyl ketone	UG/KG				12 U	11 U	12 U
Methyl chloride	UG/KG				12 U	11 U	12 U
Methyl ethyl ketone	UG/KG				12 U	11 U	12 U
Methyl isobutyl ketone	UG/KG				12 U	11 U	12 U
Methylene chloride	UG/KG				12 U	11 U	12 U
Styrene	UG/KG				12 U	11 U	12 U
Tetrachloroethene	UG/KG				12 U	11 U	12 U
Toluene	UG/KG				12 U	11 U	12 U
Total Xylenes	UG/KG				12 U	11 U	12 U
Trans-1,3-Dichloropropene	UG/KG				12 U	11 U	12 U
Trichloroethene	UG/KG				12 U	11 U	12 U
Vinyl chloride	UG/KG				12 U	11 U	12 U
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG				410 U	380 U	400 U
1,2-Dichlorobenzene	UG/KG				410 U	380 U	400 U
1,3-Dichlorobenzene	UG/KG				410 U	380 U	400 U
1,4-Dichlorobenzene	UG/KG				410 U	380 U	400 U
2,2'-oxybis(1-Chloropropane)	UG/KG				410 U	380 U	400 U
2,4,5-Trichlorophenol	UG/KG				1,000 U	930 U	960 U
2,4,6-Trichlorophenol	UG/KG				410 U	380 U	400 U
2,4-Dichlorophenol	UG/KG				410 U	380 U	400 U
2,4-Dimethylphenol	UG/KG				410 U	380 U	400 U
2,4-Dinitrophenol	UG/KG				1,000 U	930 U	960 U
2,4-Dinitrotoluene	UG/KG				410 U	380 U	400 U
2,6-Dinitrotoluene	UG/KG				410 U	380 U	400 U
2-Chloronaphthalene	UG/KG				410 U	380 U	400 U
2-Chlorophenol	UG/KG				410 U	380 U	400 U
2-Methylnaphthalene	UG/KG				410 U	380 U	400 U
2-Methylphenol	UG/KG				410 U	380 U	400 U
2-Nitroaniline	UG/KG				1,000 U	930 U	960 U
2-Nitrophenol	UG/KG				410 U	380 U	400 U
3 or 4-Methylphenol	UG/KG						
3,3'-Dichlorobenzidine	UG/KG				410 U	380 U	400 U
3-Nitroaniline	UG/KG				1,000 U	930 U	960 U
4,6-Dinitro-2-methylphenol	UG/KG				1,000 U	930 U	960 U
4-Bromophenyl phenyl ether	UG/KG				410 U	380 U	400 U
4-Chloro-3-methylphenol	UG/KG				410 U	380 U	400 U
4-Chloroaniline	UG/KG				410 U	380 U	400 U
4-Chlorophenyl phenyl ether	UG/KG				410 U	380 U	400 U
4-Methylphenol	UG/KG				410 U	380 U	400 U
4-Nitroaniline	UG/KG				1,000 U	930 U	960 U
4-Nitrophenol	UG/KG				1,000 U	930 U	960 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Sample ID		S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		5	7.5	10	0-0.2	0-0.2	0-0.2
Sample Date		3/12/2010	3/12/2010	3/12/2010	10/25/1993	10/25/1993	10/25/1993
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG				410 U	380 U	400 U
Acenaphthylene	UG/KG				410 U	380 U	400 U
Anthracene	UG/KG				410 U	380 U	400 U
Benzo(a)anthracene	UG/KG				410 U	380 U	400 U
Benzo(a)pyrene	UG/KG				410 U	380 U	400 U
Benzo(b)fluoranthene	UG/KG				410 U	380 U	400 U
Benzo(ghi)perylene	UG/KG				410 U	380 U	400 U
Benzo(k)fluoranthene	UG/KG				410 U	380 U	400 U
Bis(2-Chloroethoxy)methane	UG/KG				410 U	380 U	400 U
Bis(2-Chloroethyl)ether	UG/KG				410 U	380 U	400 U
Bis(2-Chloroisopropyl)ether	UG/KG						
Bis(2-Ethylhexyl)phthalate	UG/KG				410 U	380 U	700
Butylbenzylphthalate	UG/KG				410 U	380 U	400 U
Carbazole	UG/KG				410 U	380 U	400 U
Chrysene	UG/KG				410 U	380 U	400 U
Dibenz(a,h)anthracene	UG/KG				410 U	380 U	400 U
Dibenzofuran	UG/KG				410 U	380 U	400 U
Diethyl phthalate	UG/KG				410 U	380 U	400 U
Dimethylphthalate	UG/KG				410 U	380 U	400 U
Di-n-butylphthalate	UG/KG				410 U	380 U	400 U
Di-n-octylphthalate	UG/KG				410 U	380 U	400 U
Fluoranthene	UG/KG				410 U	380 U	400 U
Fluorene	UG/KG				410 U	380 U	400 U
Hexachlorobenzene	UG/KG				410 U	380 U	400 U
Hexachlorobutadiene	UG/KG				410 U	380 U	400 U
Hexachlorocyclopentadiene	UG/KG				410 U	380 U	400 U
Hexachloroethane	UG/KG				410 U	380 U	400 U
Indeno(1,2,3-cd)pyrene	UG/KG				410 U	380 U	400 U
Isophorone	UG/KG				410 U	380 U	400 U
Naphthalene	UG/KG				410 U	380 U	400 U
Nitrobenzene	UG/KG				410 U	380 U	400 U
N-Nitrosodiphenylamine	UG/KG				410 U	380 U	400 U
N-Nitrosodipropylamine	UG/KG				410 U	380 U	400 U
Pentachlorophenol	UG/KG				1,000 U	930 U	960 U
Phenanthrene	UG/KG				410 U	380 U	400 U
Phenol	UG/KG				410 U	380 U	400 U
Pyrene	UG/KG				410 U	380 U	400 U
Herbicides							
2,4,5-T	UG/KG				6.3 U	5.8 U	6 U
2,4,5-TP/Silvex	UG/KG				6.3 U	5.8 U	6 U
2,4-D	UG/KG				63 U	58 U	60 U
2,4-DB	UG/KG				63 U	58 U	60 U
Dalapon	UG/KG				150 U	140 U	150 U
Dicamba	UG/KG				6.3 U	5.8 U	6 U
Dichloroprop	UG/KG				63 U	58 U	60 U
Dinoseb	UG/KG				32 U	29 U	30 U
MCPA	UG/KG				9,400	6,300	6,000 U
MCPP	UG/KG				6,300 U	5,800 U	6,000 U
Explosives							
1,3,5-Trinitrobenzene	UG/KG				130 U	130 U	100 J
1,3-Dinitrobenzene	UG/KG				130 U	130 U	130 U
2,4,6-Trinitrotoluene	UG/KG				130 U	130 U	96 J
2,4-Dinitrotoluene	UG/KG				130 U	130 U	130 U
2,6-Dinitrotoluene	UG/KG				130 U	130 U	130 U
2-amino-4,6-Dinitrotoluene	UG/KG				130 U	130 U	99 J
2-Nitrotoluene	UG/KG						
3,5-Dinitroaniline	UG/KG						
3-Nitrotoluene	UG/KG						
4-amino-2,6-Dinitrotoluene	UG/KG				130 U	130 U	130 U
4-Nitrotoluene	UG/KG						
HMX	UG/KG				130 U	130 U	130 U
Nitrobenzene	UG/KG						
Nitroglycerine	UG/KG						
Pentaerythritol Tetranitrate	UG/KG						
RDX	UG/KG				130 U	130 U	100 J
Tetryl	UG/KG				130 U	130 U	130 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Sample ID		S45-TP-4-03	S45-TP-4-04	S45-TP-4-05	SS45-1	SS45-2	SS45-3
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		5	7.5	10	0-0.2	0-0.2	0-0.2
Sample Date		3/12/2010	3/12/2010	3/12/2010	10/25/1993	10/25/1993	10/25/1993
QC Type		SA	SA	SA	SA	SA	SA
Study ID		OD Initial Invest	OD Initial Invest	OD Initial Invest	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG				41 U	38 U	40 U
Aroclor-1221	UG/KG				84 U	78 U	81 U
Aroclor-1232	UG/KG				41 U	38 U	40 U
Aroclor-1242	UG/KG				41 U	38 U	40 U
Aroclor-1248	UG/KG				41 U	38 U	40 U
Aroclor-1254	UG/KG				41 U	38 U	40 U
Aroclor-1260	UG/KG				41 U	38 U	40 U
4,4'-DDD	UG/KG				4.1 U	3.8 U	4 U
4,4'-DDE	UG/KG				4.1 U	3.8 U	4 U
4,4'-DDT	UG/KG				4.1 U	3.8 U	4 U
Aldrin	UG/KG				2.1 U	2 U	2 U
Alpha-BHC	UG/KG				2.1 U	2 U	2 U
Alpha-Chlordane	UG/KG				2.1 U	2 U	2 U
Beta-BHC	UG/KG				2.1 U	2 U	2 U
Delta-BHC	UG/KG				2.1 U	2 U	2 U
Dieldrin	UG/KG				4.1 U	3.8 U	4 U
Endosulfan I	UG/KG				2.1 U	2 U	2 U
Endosulfan II	UG/KG				4.1 U	3.8 U	4 U
Endosulfan sulfate	UG/KG				4.1 U	3.8 U	4 U
Endrin	UG/KG				4.1 U	3.8 U	4 U
Endrin aldehyde	UG/KG				4.1 U	3.8 U	4 U
Endrin ketone	UG/KG				4.1 U	3.8 U	4 U
Gamma-BHC/Lindane	UG/KG				2.1 U	2 U	2 U
Gamma-Chlordane	UG/KG				2.1 U	2 U	2 U
Heptachlor	UG/KG				2.1 U	2 U	2 U
Heptachlor epoxide	UG/KG				2.1 U	2 U	2 U
Methoxychlor	UG/KG				21 U	20 U	20 U
Toxaphene	UG/KG				210 U	200 U	200 U
Inorganics							
Aluminum	MG/KG	12,700	9,690	10,800	17,300	19,400	18,900
Antimony	MG/KG	0.19 UJ	0.16 J	0.14 UJ	10 UJ	11.5 UJ	10.8 UJ
Arsenic	MG/KG	5	3.3	5.4	5	5.5	5.1
Barium	MG/KG	151	108	76.1	122	194	115
Beryllium	MG/KG	0.58	0.42 J	0.54	0.7 J	0.77 J	0.83 J
Cadmium	MG/KG	4.5	1.8	0.01 U	2.8	2.4	1.1
Calcium	MG/KG	41,800	40,400	53,900	8,510	10,300	21,800
Chromium	MG/KG	22.8	14.4	18.8	24.1	39.3	27.4
Cobalt	MG/KG	10.4	6.4	11	10.8	24.3	14.1
Copper	MG/KG	240	115	24.7	79.4	192	55.8
Cyanide	MG/KG				0.56 U	0.57 U	0.58 U
Iron	MG/KG	25,300	15,500	19,000	25,800	75,700	30,500
Lead	MG/KG	50.9	30.3	11.2	20.4	15.7	12
Magnesium	MG/KG	10,300	12,500	8,380	5,530	5,950	6,790
Manganese	MG/KG	466	380	379	562	1,150	627
Nickel	MG/KG	35.5	20	34.3	29.4 UR	41.3 UR	40.5 UR
Potassium	MG/KG	1,890 J	1,870 J	1,790 J	2,310	3,140	2,720
Selenium	MG/KG	0.56 J	0.22 U	0.3 U	0.27 U	0.18 U	0.21 U
Silver	MG/KG	1.4 J	0.38 J	0.12 J	1.3 UJ	1.5 UJ	2.1
Sodium	MG/KG	196	166	188	67.1 J	100 J	114 J
Thallium	MG/KG	0.18 U	0.09 U	0.15 J	0.29 UJ	0.2 UJ	0.23 UJ
Vanadium	MG/KG	21.7	17.5	18.5	28.6	35.4	30.5
Zinc	MG/KG	371	336	80.1	148 UR	122 UR	115 UR
Mercury	MG/KG	9.1	6.7	0.04	0.43	0.63	0.17

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		SS45-4	SS45-5	SS45-5	SS45-6	SS45-7	SS45-8
Sample ID		SS45-4	SS45-10	SS45-5	SS45-6	SS45-7	SS45-8
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Sample Date		10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993
QC Type		SA	DU	SA	SA	SA	SA
Study ID		ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1,2,2-Tetrachloroethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1,2-Trichloroethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1-Dichloroethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,1-Dichloroethene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,2-Dichloroethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,2-Dichloroethene (total)	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
1,2-Dichloropropane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Acetone	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Benzene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Bromodichloromethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Bromoform	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Carbon disulfide	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Carbon tetrachloride	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Chlorobenzene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Chlorodibromomethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Chloroethane	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Chloroform	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Cis-1,3-Dichloropropene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Ethyl benzene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl bromide	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl butyl ketone	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl chloride	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl ethyl ketone	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Methyl isobutyl ketone	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Methylene chloride	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Styrene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Tetrachloroethene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Toluene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Total Xylenes	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Trans-1,3-Dichloropropene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Trichloroethene	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Vinyl chloride	UG/KG	11 UJ	12 U	12 U	11 U	11 U	12 U
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
1,2-Dichlorobenzene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
1,3-Dichlorobenzene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
1,4-Dichlorobenzene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2,2'-oxybis(1-Chloropropane)	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2,4,5-Trichlorophenol	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
2,4,6-Trichlorophenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2,4-Dichlorophenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2,4-Dimethylphenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2,4-Dinitrophenol	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
2,4-Dinitrotoluene	UG/KG	360 U	75 J	160 J	830	380 U	420 U
2,6-Dinitrotoluene	UG/KG	360 U	390 U	390 U	41 J	380 U	420 U
2-Chloronaphthalene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2-Chlorophenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2-Methylnaphthalene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2-Methylphenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
2-Nitroaniline	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
2-Nitrophenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
3 or 4-Methylphenol	UG/KG						
3,3'-Dichlorobenzidine	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
3-Nitroaniline	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
4,6-Dinitro-2-methylphenol	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
4-Bromophenyl phenyl ether	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
4-Chloro-3-methylphenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
4-Chloroaniline	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
4-Chlorophenyl phenyl ether	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
4-Methylphenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
4-Nitroaniline	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
4-Nitrophenol	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		SS45-4	SS45-5	SS45-5	SS45-6	SS45-7	SS45-8
Sample ID		SS45-4	SS45-10	SS45-5	SS45-6	SS45-7	SS45-8
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Sample Date		10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993
QC Type		SA	DU	SA	SA	SA	SA
Study ID		ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Acenaphthylene	UG/KG	360 U	390 U	30 J	360 U	380 U	420 U
Anthracene	UG/KG	360 U	390 U	18 J	360 U	380 U	420 U
Benzo(a)anthracene	UG/KG	360 U	32 J	50 J	31 J	380 U	420 U
Benzo(a)pyrene	UG/KG	360 U	44 J	82 J	45 J	380 U	420 U
Benzo(b)fluoranthene	UG/KG	360 U	33 J	55 J	36 J	380 U	420 U
Benzo(ghi)perylene	UG/KG	360 U	27 J	39 J	360 U	380 U	420 U
Benzo(k)fluoranthene	UG/KG	360 U	18 J	58 J	360 U	380 U	420 U
Bis(2-Chloroethoxy)methane	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Bis(2-Chloroethyl)ether	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Bis(2-Chloroisopropyl)ether	UG/KG						
Bis(2-Ethylhexyl)phthalate	UG/KG	430	700	740	360 U	210 J	470
Butylbenzylphthalate	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Carbazole	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Chrysene	UG/KG	19 J	55 J	68 J	52 J	380 U	20 J
Dibenz(a,h)anthracene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Dibenzofuran	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Diethyl phthalate	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Dimethylphthalate	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Di-n-butylphthalate	UG/KG	360 U	31 J	110 J	900	380 U	420 U
Di-n-octylphthalate	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Fluoranthene	UG/KG	23 J	44 J	66 J	42 J	380 U	22 J
Fluorene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Hexachlorobenzene	UG/KG	20 J	41 J	43 J	55 J	380 U	420 U
Hexachlorobutadiene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Hexachlorocyclopentadiene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Hexachloroethane	UG/KG	360 U	390 U	390 U	21 J	380 U	420 U
Indeno(1,2,3-cd)pyrene	UG/KG	360 U	390 U	52 J	360 U	380 U	420 U
Isophorone	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Naphthalene	UG/KG	360 U	390 U	21 J	360 U	380 U	420 U
Nitrobenzene	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
N-Nitrosodiphenylamine	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
N-Nitrosodipropylamine	UG/KG	360 U	390 U	390 U	110 J	380 U	420 U
Pentachlorophenol	UG/KG	870 U	950 U	950 U	870 U	920 U	1,000 U
Phenanthrene	UG/KG	360 U	31 J	38 J	25 J	380 U	420 U
Phenol	UG/KG	360 U	390 U	390 U	360 U	380 U	420 U
Pyrene	UG/KG	35 J	76 J	100 J	79 J	380 U	30 J
Herbicides							
2,4,5-T	UG/KG	5.4 U	6 U	5.9 U	5.5 U	5.7 U	6.3 U
2,4,5-TP/Silvex	UG/KG	5.4 U	6 U	5.9 UJ	5.5 U	5.7 U	6.3 U
2,4-D	UG/KG	54 U	60 U	59 U	55 U	57 U	63 U
2,4-DB	UG/KG	54 U	60 U	59 U	55 U	57 U	63 U
Dalapon	UG/KG	130 U	150 U	150 U	130 U	140 U	160 U
Dicamba	UG/KG	5.4 U	6 U	5.9 U	5.5 U	5.7 U	6.3 U
Dichloroprop	UG/KG	54 U	60 U	59 U	55 U	57 U	63 U
Dinoseb	UG/KG	27 U	30 U	30 UJ	28 U	29 U	32 U
MCPA	UG/KG	5,400 U	6,000 U	5,900 U	5,500 U	5,700 U	6,300 U
MCPP	UG/KG	5,400 U	6,000 U	5,900 U	5,500 U	5,700 U	6,300 U
Explosives							
1,3,5-Trinitrobenzene	UG/KG	100 U	130 UJ	130 UJ	120 J	130 UJ	130 UJ
1,3-Dinitrobenzene	UG/KG	130 U	130 UJ	130 UJ	130 U	130 UJ	130 UJ
2,4,6-Trinitrotoluene	UG/KG	130 U	80 J	84 J	190	130 UJ	130 UJ
2,4-Dinitrotoluene	UG/KG	110 J	140 J	150 J	160	130 UJ	130 UJ
2,6-Dinitrotoluene	UG/KG	130 U	130 UJ	130 UJ	130 U	130 UJ	130 UJ
2-amino-4,6-Dinitrotoluene	UG/KG	130 U	270 J	280 J	590	130 UJ	130 UJ
2-Nitrotoluene	UG/KG						
3,5-Dinitroaniline	UG/KG						
3-Nitrotoluene	UG/KG						
4-amino-2,6-Dinitrotoluene	UG/KG	130 U	130 UJ	130 UJ	130 U	130 UJ	130 UJ
4-Nitrotoluene	UG/KG						
HMX	UG/KG	130 U	140 J	120 J	130 U	130 UJ	130 UJ
Nitrobenzene	UG/KG						
Nitroglycerine	UG/KG						
Pentaerythritol Tetranitrate	UG/KG						
RDX	UG/KG	82 J	290 J	280 J	1,800	83 J	130 UJ
Tetryl	UG/KG	90 J	130 J	130 UJ	330	130 UJ	130 UJ

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID	SS45-4	SS45-5	SS45-5	SS45-6	SS45-7	SS45-8
Sample ID	SS45-4	SS45-10	SS45-5	SS45-6	SS45-7	SS45-8
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Sample Date	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993	10/25/1993
QC Type	SA	DU	SA	SA	SA	SA
Study ID	ESI	ESI	ESI	ESI	ESI	ESI

Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs							
Aroclor-1016	UG/KG	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1221	UG/KG	73 U	78 U	80 U	73 U	77 U	84 U
Aroclor-1232	UG/KG	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1242	UG/KG	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1248	UG/KG	36 U	38 U	39 U	36 U	38 U	41 U
Aroclor-1254	UG/KG	36 U	110 J	39 U	36 U	38 U	41 U
Aroclor-1260	UG/KG	36 U	38 U	39 U	36 U	38 U	41 U
4,4'-DDD	UG/KG	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
4,4'-DDE	UG/KG	3.2 J	3.4 J	3.9 U	4.2 J	3.8 U	4.1 U
4,4'-DDT	UG/KG	3.6 U	3.4 J	3.9 U	2.8 J	3.8 U	4.1 U
Aldrin	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Alpha-BHC	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Alpha-Chlordane	UG/KG	1.5 J	1.1 J	2 U	2 J	1.9 U	2.1 U
Beta-BHC	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Delta-BHC	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Dieldrin	UG/KG	2.5 J	3.8 U	3.9 U	3.2 J	3.8 U	4.1 U
Endosulfan I	UG/KG	1.8 U	2 U	1.8 J	1.8 U	1.9 U	2.1 U
Endosulfan II	UG/KG	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endosulfan sulfate	UG/KG	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endrin	UG/KG	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endrin aldehyde	UG/KG	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Endrin ketone	UG/KG	3.6 U	3.8 U	3.9 U	3.6 U	3.8 U	4.1 U
Gamma-BHC/Lindane	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Gamma-Chlordane	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Heptachlor	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Heptachlor epoxide	UG/KG	1.8 U	2 U	2 U	1.8 U	1.9 U	2.1 U
Methoxychlor	UG/KG	18 U	20 U	20 U	18 U	19 U	21 U
Toxaphene	UG/KG	180 U	200 U	200 U	180 U	190 U	210 U
Inorganics							
Aluminum	MG/KG	14,900	15,600	17,600	16,300	18,000	18,600
Antimony	MG/KG	7.9 UJ	10.1 UJ	9.3 UJ	8.5 UJ	9.7 UJ	11.4 UJ
Arsenic	MG/KG	5.1	6.4	6.2	5.5	6.8	6.4
Barium	MG/KG	143	151	161	160	163	365
Beryllium	MG/KG	0.63 J	0.7 J	0.72 J	0.71 J	0.82 J	0.69 J
Cadmium	MG/KG	3.9	9.5 J	9.5 J	8.8	1.6 J	4.8 J
Calcium	MG/KG	47,000	47,000	26,000	23,400	6,930	16,800
Chromium	MG/KG	22.9	23.8	26.9	24.2	24.8	27.2
Cobalt	MG/KG	12.4	12.2	12.9	11.7	13.1	12.1
Copper	MG/KG	155	405	538	491	69.8	293
Cyanide	MG/KG	0.54 U	0.67 U	0.72 U	0.52 U	0.66 U	0.72 U
Iron	MG/KG	26,700	30,400	31,400	28,100	29,900	29,400
Lead	MG/KG	34.9	54.9	63.6	63.2	21.9	66.9
Magnesium	MG/KG	8,420	7,000	7,320	6,440	5,170	6,740
Manganese	MG/KG	530	599	575	555	1,050	489
Nickel	MG/KG	35.2 UR	36.4	40.5	34.2 UR	35.1	39.4
Potassium	MG/KG	2,100	1,980	2,140	2,060	2,080	2,530
Selenium	MG/KG	0.23 U	0.22 UJ	0.18 UJ	0.18 U	0.22 UJ	0.24 UJ
Silver	MG/KG	1 UJ	2.7 J	3.5 J	4.3	1.2 UJ	2.3 J
Sodium	MG/KG	142 J	104 J	110 J	112 J	136 J	93.5 J
Thallium	MG/KG	0.25 UJ	0.24 U	0.19 U	0.2 UJ	0.24 U	0.26 U
Vanadium	MG/KG	23.7	25.8	27.9	27.3	32.5	30
Zinc	MG/KG	208 UR	361	427	347 UR	126	306
Mercury	MG/KG	0.43	2.1 J	1.5 J	2.4	0.41 J	1.9 J

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		SS45-9	TP45-1	TP45-1	TP45-2	TP45-3	TP45-4	TP45-5
Sample ID		SS45-9	TP45-1	TP45-11	TP45-2	TP45-3	TP45-4	TP45-5
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0-0.2	3-3	3-3	3-3	3-3	3-3	3-3
Sample Date		10/25/1993	11/11/1993	11/11/1993	11/11/1993	11/11/1993	11/9/1993	11/9/1993
QC Type		SA	SA	DU	SA	SA	SA	SA
Study ID		ESI	ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds								
1,1,1-Trichloroethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1,2-Trichloroethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1-Dichloroethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,1-Dichloroethene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,2-Dichloroethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,2-Dichloroethene (total)	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
1,2-Dichloropropane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Acetone	UG/KG	12 U	11 U	11 U	12 U	31 U	11 U	11 U
Benzene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Bromodichloromethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Bromoform	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Carbon disulfide	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Carbon tetrachloride	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chlorobenzene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chlorodibromomethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chloroethane	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Chloroform	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Cis-1,3-Dichloropropene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Ethyl benzene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl bromide	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl butyl ketone	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl chloride	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl ethyl ketone	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methyl isobutyl ketone	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Methylene chloride	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Styrene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Tetrachloroethene	UG/KG	12 U	4 J	6 J	8 J	19	2 J	3 J
Toluene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Total Xylenes	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Trans-1,3-Dichloropropene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Trichloroethene	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Vinyl chloride	UG/KG	12 U	11 U	11 U	12 U	11 U	11 U	11 U
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
1,2-Dichlorobenzene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
1,3-Dichlorobenzene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
1,4-Dichlorobenzene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,2'-oxybis(1-Chloropropane)	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4,5-Trichlorophenol	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
2,4,6-Trichlorophenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4-Dichlorophenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4-Dimethylphenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2,4-Dinitrophenol	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
2,4-Dinitrotoluene	UG/KG	390 U	100 J	190 J	14,000	84 J	59 J	230 J
2,6-Dinitrotoluene	UG/KG	390 U	370 U	360 U	700 J	400 U	460 U	370 U
2-Chloronaphthalene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Chlorophenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Methylnaphthalene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Methylphenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
2-Nitroaniline	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
2-Nitrophenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
3 or 4-Methylphenol	UG/KG							
3,3'-Dichlorobenzidine	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
3-Nitroaniline	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
4,6-Dinitro-2-methylphenol	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
4-Bromophenyl phenyl ether	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Chloro-3-methylphenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Chloroaniline	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Chlorophenyl phenyl ether	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Methylphenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
4-Nitroaniline	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
4-Nitrophenol	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		SS45-9	TP45-1	TP45-1	TP45-2	TP45-3	TP45-4	TP45-5
Sample ID		SS45-9	TP45-1	TP45-11	TP45-2	TP45-3	TP45-4	TP45-5
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0-0.2	3-3	3-3	3-3	3-3	3-3	3-3
Sample Date		10/25/1993	11/11/1993	11/11/1993	11/11/1993	11/11/1993	11/9/1993	11/9/1993
QC Type		SA	SA	DU	SA	SA	SA	SA
Study ID		ESI	ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Acenaphthene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Acenaphthylene	UG/KG	390 U	19 J	17 J	1,900 U	400 U	460 U	370 U
Anthracene	UG/KG	390 U	17 J	360 U	1,900 U	400 U	460 U	370 U
Benzo(a)anthracene	UG/KG	390 U	32 J	30 J	1,900 U	22 J	36 J	32 J
Benzo(a)pyrene	UG/KG	390 U	46 J	41 J	1,900 U	28 J	45 J	42 J
Benzo(b)fluoranthene	UG/KG	20 J	38 J	36 J	1,900 U	24 J	39 J	42 J
Benzo(ghi)perylene	UG/KG	390 U	66 J	58 J	1,900 U	34 J	53 J	45 J
Benzo(k)fluoranthene	UG/KG	390 U	28 J	26 J	1,900 U	21 J	34 J	23 J
Bis(2-Chloroethoxy)methane	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Bis(2-Chloroethyl)ether	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Bis(2-Chloroisopropyl)ether	UG/KG							
Bis(2-Ethylhexyl)phthalate	UG/KG	350 J	65 J	50 J	1,900 U	400 U	460 U	370 U
Butylbenzylphthalate	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Carbazole	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Chrysene	UG/KG	27 J	46 J	44 J	1,900 U	37 J	51 J	47 J
Dibenz(a,h)anthracene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Dibenzofuran	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Diethyl phthalate	UG/KG	390 U	370 U	360 U	1,900 U	400 U	35 J	370 U
Dimethylphthalate	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Di-n-butylphthalate	UG/KG	390 U	35 J	170 J	6,800	27 J	75 J	230 J
Di-n-octylphthalate	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Fluoranthene	UG/KG	30 J	59 J	50 J	1,900 U	52 J	68 J	58 J
Fluorene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Hexachlorobenzene	UG/KG	30 J	62 J	54 J	1,900 U	52 J	48 J	42 J
Hexachlorobutadiene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Hexachlorocyclopentadiene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Hexachloroethane	UG/KG	390 U	72 J	68 J	1,900 U	1,100	41 J	36 J
Indeno(1,2,3-cd)pyrene	UG/KG	390 U	37 J	360 U	1,900 U	400 U	29 J	26 J
Isophorone	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Naphthalene	UG/KG	390 U	30 J	27 J	1,900 U	24 J	30 J	370 U
Nitrobenzene	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
N-Nitrosodiphenylamine	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
N-Nitrosodipropylamine	UG/KG	390 U	370 U	30 J	1,600 J	20 J	460 U	25 J
Pentachlorophenol	UG/KG	940 U	890 U	880 U	4,600 U	960 U	1,100 U	900 U
Phenanthrene	UG/KG	18 J	46 J	38 J	1,900 U	38 J	44 J	34 J
Phenol	UG/KG	390 U	370 U	360 U	1,900 U	400 U	460 U	370 U
Pyrene	UG/KG	36 J	110 J	98 J	100 J	90 J	110 J	97 J
Herbicides								
2,4,5-T	UG/KG	5.9 U	5.6 U	5.5 U	5.8 U	6 U	6.9 U	5.6 U
2,4,5-TP/Silvex	UG/KG	5.9 U	5.6 U	5.5 U	5.8 U	6 U	6.9 U	5.6 U
2,4-D	UG/KG	59 U	56 U	55 U	58 U	60 U	69 U	56 U
2,4-DB	UG/KG	59 U	56 U	55 U	58 U	60 U	69 U	56 U
Dalapon	UG/KG	150 U	140 U	140 U	140 U	150 U	170 U	140 U
Dicamba	UG/KG	5.9 U	5.6 U	5.5 U	5.8 U	6 U	6.9 U	5.6 U
Dichloroprop	UG/KG	59 U	56 U	55 U	58 U	60 U	69 U	56 U
Dinoseb	UG/KG	30 U	28 U	28 U	29 U	30 U	35 U	28 U
MCPA	UG/KG	5,900 U	5,600 U	5,500 U	5,800 U	6,000 U	6,900 U	5,600 U
MCPP	UG/KG	5,900 U	5,600 U	5,500 U	5,800 U	6,000 U	6,900 U	5,600 U
Explosives								
1,3,5-Trinitrobenzene	UG/KG	130 UJ	150 J	170 J	190 J	130 UJ	180	140
1,3-Dinitrobenzene	UG/KG	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 U	130 U
2,4,6-Trinitrotoluene	UG/KG	1,400 J	330 J	340 J	600 J	400 J	330	280
2,4-Dinitrotoluene	UG/KG	130 UJ	130 UJ	140 J	190 J	120 J	110 J	90 J
2,6-Dinitrotoluene	UG/KG	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 U	130 U
2-amino-4,6-Dinitrotoluene	UG/KG	130 UJ	430 J	430 J	680 J	530 J	480	350
2-Nitrotoluene	UG/KG							
3,5-Dinitroaniline	UG/KG							
3-Nitrotoluene	UG/KG							
4-amino-2,6-Dinitrotoluene	UG/KG	270 J	130 UJ	130 UJ	130 UJ	130 UJ	130 U	130 U
4-Nitrotoluene	UG/KG							
HMX	UG/KG	130 UJ	250 J	430 J	470 J	240 J	350	200
Nitrobenzene	UG/KG							
Nitroglycerine	UG/KG							
Pentaerythritol Tetranitrate	UG/KG							
RDX	UG/KG	5,800 J	2,500 J	1,600 J	2,700 J	2,500 J	4,300	1,300
Tetryl	UG/KG	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ	130 U	180 J

Table A.1.1
Analytical Data for Surface and Subsurface Soil Samples at OD Grounds
Feasibility Studies - OD Grounds
Seneca Army Depot

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		SS45-9	TP45-1	TP45-1	TP45-2	TP45-3	TP45-4	TP45-5
Sample ID		SS45-9	TP45-1	TP45-11	TP45-2	TP45-3	TP45-4	TP45-5
Matrix		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (FT)		0-0.2	3-3	3-3	3-3	3-3	3-3	3-3
Sample Date		10/25/1993	11/11/1993	11/11/1993	11/11/1993	11/11/1993	11/9/1993	11/9/1993
QC Type		SA	SA	DU	SA	SA	SA	SA
Study ID		ESI	ESI	ESI	ESI	ESI	ESI	ESI
Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Pesticides/PCBs								
Aroclor-1016	UG/KG	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1221	UG/KG	78 UR	74 U	74 U	77 U	81 U	93 U	75 U
Aroclor-1232	UG/KG	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1242	UG/KG	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1248	UG/KG	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1254	UG/KG	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
Aroclor-1260	UG/KG	38 UR	37 U	36 U	38 U	40 U	46 U	37 U
4,4'-DDD	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
4,4'-DDE	UG/KG	3.3 J	3.7 U	3.6 U	3.8 U	4 U	3.2 J	1.9 J
4,4'-DDT	UG/KG	3.8 UR	3.7 U	2.3 J	3.8 U	2.9 J	4.6 U	3.7 U
Aldrin	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Alpha-BHC	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Alpha-Chlordane	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Beta-BHC	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Delta-BHC	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Dieldrin	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	2.4 J	3.7 U
Endosulfan I	UG/KG	1 J	1.9 J	2.2 J	1.9 J	1.6 J	2.4 U	1.9 U
Endosulfan II	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endosulfan sulfate	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endrin	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endrin aldehyde	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Endrin ketone	UG/KG	3.8 UR	3.7 U	3.6 U	3.8 U	4 U	4.6 U	3.7 U
Gamma-BHC/Lindane	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Gamma-Chlordane	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Heptachlor	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Heptachlor epoxide	UG/KG	2 UR	1.9 U	1.9 U	2 U	2 U	2.4 U	1.9 U
Methoxychlor	UG/KG	20 UR	19 U	19 U	20 U	20 U	24 U	19 U
Toxaphene	UG/KG	200 UR	190 U	190 U	200 U	200 U	240 U	190 U
Inorganics								
Aluminum	MG/KG	17,800	20,100	16,500	20,800	22,800	20,600	17,300
Antimony	MG/KG	9.4 UJ	9.7 UJ	7.6 UJ	12.1 UJ	12.4 UJ	10.2 U	9.2 U
Arsenic	MG/KG	6.1	6.8	6.3	7.1	8.2	6 J	5.1 J
Barium	MG/KG	202	208	177	201	248	216	174
Beryllium	MG/KG	0.79 J	0.9 J	0.8	0.91 J	1.1 J	0.94 J	0.8 J
Cadmium	MG/KG	5.5 J	10.4 J	9.6 J	9.5 J	13.1 J	10.9 UR	7.4 UR
Calcium	MG/KG	22,600	42,700	31,500	26,400	32,500	36,400	32,100
Chromium	MG/KG	27.4	31.3	25.7	30.1	35.5	32.1	27.6
Cobalt	MG/KG	15	13.2	13.2	12.8	16.9	15.3	12.1
Copper	MG/KG	267	722	555	561	791	1,240 J	449 J
Cyanide	MG/KG	0.7 U	0.7	0.54 U	0.55 U	0.55 U	0.62	0.51 U
Iron	MG/KG	32,500	35,700	31,900	31,500	41,300	37,600	31,600
Lead	MG/KG	77.7	54.1	73.3	69.4	87.8	74.7	61.9
Magnesium	MG/KG	7,110	7,910	7,780	7,800	9,270	8,940	7,570
Manganese	MG/KG	912	1,380	613	605	827	726	600
Nickel	MG/KG	42.5	41.8	39.1	40.5	51	48.3	39.2
Potassium	MG/KG	2,260	3,040	1,960	3,280	3,010	2,400	1,960
Selenium	MG/KG	0.24 UJ	0.23 UJ	0.15 UJ	0.16 UJ	0.23 UJ	0.27 UJ	0.2 UJ
Silver	MG/KG	1.3 J	3.2 J	4.7 J	5 J	6.6 J	26.2 J	3.9 J
Sodium	MG/KG	93.4 J	141 J	105 J	116 J	135 J	136 J	122 J
Thallium	MG/KG	0.26 U	0.25 U	0.16 U	0.17 U	0.25 U	0.29 UJ	0.22 UJ
Vanadium	MG/KG	28.9	32.4	26.7	34.4	38	32.6	27.3
Zinc	MG/KG	383	345	360	390	538	557 J	333 J
Mercury	MG/KG	1.9 J	3.1 J	1.4 J	3.1 J	4 J	3.6	4.3

Notes:
(if necessary) by during data validation.
U = non-detect, i.e. not detected equal to or above this value.
[blank] = detect, i.e. detected chemical result value.
results. Sample duplicate pairs have not been averaged.
3) Chemical results greater than the action level are highlighted, bolded and boxed
4) Criteria action level source document and web address.
Objectives.
http://www.dec.ny.gov/regs/15507.html

Area		SEAD-45	SEAD-45	SEAD-45	SEAD-45
Loc ID		SW/SD45-1	SW/SD45-2	SW/SD45-3	SW/SD45-4
Matrix		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample ID		SD45-1	SD45-2	SD45-3	SD45-4
Sample Depth Interval (FT)		0-0.5	0-0.5	0-0.5	0-0.5
Sample Date		11/1/1993	11/1/1993	11/1/1993	11/1/1993
QC Type		SA	SA	SA	SA
Study ID		ESI	ESI	ESI	ESI
Sample Round					
Filtered		N	N	N	N
Criteria					

Parameter	Unit	Value Qual	Value Qual	Value Qual	Value Qual
Volatile Organic Compounds					
1,1,1-Trichloroethane	UG/KG	13 U	14 U	15 U	13 U
1,1,2,2-Tetrachloroethane	UG/KG	13 U	14 U	15 U	13 U
1,1,2-Trichloroethane	UG/KG	13 U	14 U	15 U	13 U
1,1-Dichloroethane	UG/KG	13 U	14 U	15 U	13 U
1,1-Dichloroethene	UG/KG	13 U	14 U	15 U	13 U
1,2-Dichloroethane	UG/KG	13 U	14 U	15 U	13 U
1,2-Dichloroethene (total)	UG/KG	13 U	14 U	15 U	13 U
1,2-Dichloropropane	UG/KG	13 U	14 U	15 U	13 U
Acetone	UG/KG	13 U	14 U	15 U	13 U
Benzene	UG/KG	13 U	14 U	15 U	13 U
Bromodichloromethane	UG/KG	13 U	14 U	15 U	13 U
Bromoform	UG/KG	13 U	14 U	15 U	13 U
Carbon disulfide	UG/KG	13 U	14 U	15 U	13 U
Carbon tetrachloride	UG/KG	13 U	14 U	15 U	13 U
Chlorobenzene	UG/KG	13 U	14 U	15 U	13 U
Chlorodibromomethane	UG/KG	13 U	14 U	15 U	13 U
Chloroethane	UG/KG	13 U	14 U	15 U	13 U
Chloroform	UG/KG	13 U	14 U	15 U	13 U
Cis-1,3-Dichloropropene	UG/KG	13 U	14 U	15 U	13 U
Ethyl benzene	UG/KG	13 U	14 U	15 U	13 U
Methyl bromide	UG/KG	13 U	14 U	15 U	13 U
Methyl butyl ketone	UG/KG	13 U	14 U	15 U	13 U
Methyl chloride	UG/KG	13 U	14 U	15 U	13 U
Methyl ethyl ketone	UG/KG	13 U	14 U	15 U	13 U
Methyl isobutyl ketone	UG/KG	13 U	14 U	15 U	13 U
Methylene chloride	UG/KG	13 U	14 U	15 U	13 U
Styrene	UG/KG	13 U	14 U	15 U	13 U
Tetrachloroethene	UG/KG	13 U	14 U	15 U	13 U
Toluene	UG/KG	13 U	14 U	15 U	13 U
Total Xylenes	UG/KG	13 U	14 U	15 U	13 U
Trans-1,3-Dichloropropene	UG/KG	13 U	14 U	15 U	13 U
Trichloroethene	UG/KG	13 U	14 U	15 U	13 U
Vinyl chloride	UG/KG	13 U	14 U	15 U	13 U
Herbicides					
2,4,5-T	UG/KG	6.4 U	8 U	7.6 U	6.8 U
2,4,5-TP/Silvex	UG/KG	6.4 U	8 U	7.6 U	6.8 U
2,4-D	UG/KG	64 U	80 U	76 U	68 U
2,4-DB	UG/KG	64 U	80 U	76 U	68 U
Dalapon	UG/KG	160 U	200 U	190 U	170 U
Dicamba	UG/KG	6.4 U	8 U	7.6 U	6.8 U
Dichloroprop	UG/KG	64 U	80 U	76 U	68 U
Dinoseb	UG/KG	32 U	40 U	38 U	34 U
MCPA	UG/KG	6,400 U	8,000 U	7,600 U	6,800 U
MCPP	UG/KG	6,400 U	8,000 U	7,600 U	6,800 U
Explosives					
1,3,5-Trinitrobenzene	UG/KG	130 U	130 U	130 U	130 U
1,3-Dinitrobenzene	UG/KG	130 U	130 U	130 U	130 U
2,4,6-Trinitrotoluene	UG/KG	130 U	120 J	130 U	130 U
2,4-Dinitrotoluene	UG/KG	130 U	83 J	130 U	130 U
2,6-Dinitrotoluene	UG/KG	130 U	130 U	130 U	130 U
2-amino-4,6-Dinitrotoluene	UG/KG	130 U	260	130 U	130 U
4-amino-2,6-Dinitrotoluene	UG/KG	130 U	130 U	130 U	130 U
HMX	UG/KG	130 U	130 U	130 U	130 U
RDX	UG/KG	130 U	210	130 U	130 U
Tetryl	UG/KG	130 U	140 J	130 U	130 U
Semivolatile Organic Compounds					
1,2,4-Trichlorobenzene	UG/KG	420 U	530 U	500 U	440 U
1,2-Dichlorobenzene	UG/KG	420 U	530 U	500 U	440 U
1,3-Dichlorobenzene	UG/KG	420 U	530 U	500 U	440 U
1,4-Dichlorobenzene	UG/KG	420 U	530 U	500 U	440 U
2,2'-oxybis(1-Chloropropane)	UG/KG	420 U	530 U	500 U	440 U
2,4,5-Trichlorophenol	UG/KG	1,000 U	1,300 U	1,200 U	1,100 U
2,4,6-Trichlorophenol	UG/KG	420 U	530 U	500 U	440 U
2,4-Dichlorophenol	UG/KG	420 U	530 U	500 U	440 U

Table A.1.2

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Matrix		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Sample ID		SD45-1		SD45-2		SD45-3		SD45-4	
Sample Depth Interval (FT)		0-0.5		0-0.5		0-0.5		0-0.5	
Sample Date		11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type		SA		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI	
Sample Round									
Filtered		N		N		N		N	
Criteria									
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual
2,4-Dimethylphenol	UG/KG	420	U	530	U	500	U	440	U
2,4-Dinitrophenol	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
2,4-Dinitrotoluene	UG/KG	420	U	530	U	500	U	440	U
2,6-Dinitrotoluene	UG/KG	420	U	530	U	500	U	440	U
2-Chloronaphthalene	UG/KG	420	U	530	U	500	U	440	U
2-Chlorophenol	UG/KG	420	U	530	U	500	U	440	U
2-Methylnaphthalene	UG/KG	420	U	530	U	500	U	440	U
2-Methylphenol	UG/KG	420	U	530	U	500	U	440	U
2-Nitroaniline	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
2-Nitrophenol	UG/KG	420	U	530	U	500	U	440	U
3,3'-Dichlorobenzidine	UG/KG	420	U	530	U	500	U	440	U
3-Nitroaniline	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
4,6-Dinitro-2-methylphenol	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
4-Bromophenyl phenyl ether	UG/KG	420	U	530	U	500	U	440	U
4-Chloro-3-methylphenol	UG/KG	420	U	530	U	500	U	440	U
4-Chloroaniline	UG/KG	420	U	530	U	500	U	440	U
4-Chlorophenyl phenyl ether	UG/KG	420	U	530	U	500	U	440	U
4-Methylphenol	UG/KG	420	U	530	U	500	U	440	U
4-Nitroaniline	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
4-Nitrophenol	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
Acenaphthene	UG/KG	420	U	530	U	500	U	440	U
Acenaphthylene	UG/KG	420	U	530	U	500	U	440	U
Anthracene	UG/KG	420	U	530	U	500	U	440	U
Benzo(a)anthracene	UG/KG	420	U	32	J	23	J	440	U
Benzo(a)pyrene	UG/KG	420	U	37	J	28	J	440	U
Benzo(b)fluoranthene	UG/KG	420	U	37	J	28	J	440	U
Benzo(ghi)perylene	UG/KG	420	U	48	J	500	U	440	U
Benzo(k)fluoranthene	UG/KG	420	U	28	J	26	J	440	U
Bis(2-Chloroethoxy)methane	UG/KG	420	U	530	U	500	U	440	U
Bis(2-Chloroethyl)ether	UG/KG	420	U	530	U	500	U	440	U
Bis(2-Ethylhexyl)phthalate	UG/KG	420	U	530	U	500	U	440	U
Butylbenzylphthalate	UG/KG	420	U	530	U	500	U	440	U
Carbazole	UG/KG	420	U	530	U	500	U	440	U
Chrysene	UG/KG	420	U	50	J	36	J	20	J
Dibenz(a,h)anthracene	UG/KG	420	U	530	U	500	U	440	U
Dibenzofuran	UG/KG	420	U	530	U	500	U	440	U
Diethyl phthalate	UG/KG	420	U	530	U	500	U	440	U
Dimethylphthalate	UG/KG	420	U	530	U	500	U	440	U
Di-n-butylphthalate	UG/KG	420	U	25	J	500	U	440	U
Di-n-octylphthalate	UG/KG	420	U	530	U	500	U	440	U
Fluoranthene	UG/KG	420	U	60	J	47	J	31	J
Fluorene	UG/KG	420	U	530	U	500	U	440	U
Hexachlorobenzene	UG/KG	420	U	40	J	500	U	30	J
Hexachlorobutadiene	UG/KG	420	U	530	U	500	U	440	U
Hexachlorocyclopentadiene	UG/KG	420	U	530	U	500	U	440	U
Hexachloroethane	UG/KG	420	U	530	U	500	U	440	U
Indeno(1,2,3-cd)pyrene	UG/KG	420	U	32	J	500	U	440	U
Isophorone	UG/KG	420	U	530	U	500	U	440	U
Naphthalene	UG/KG	420	U	530	U	500	U	24	J
Nitrobenzene	UG/KG	420	U	530	U	500	U	440	U
N-Nitroso-di-n-propylamine	UG/KG	420	U	530	U	500	U	440	U
N-Nitrosodiphenylamine	UG/KG	420	U	530	U	500	U	440	U
Pentachlorophenol	UG/KG	1,000	U	1,300	U	1,200	U	1,100	U
Phenanthrene	UG/KG	420	U	34	J	24	J	25	J
Phenol	UG/KG	420	U	530	U	500	U	440	U
Pyrene	UG/KG	420	U	110	J	59	J	61	J
Pesticides/PCBs									
4,4'-DDD	UG/KG	4.2	U	5.3	U	5	U	4.5	U
4,4'-DDE	UG/KG	4.2	U	**4.3**	**J**	5	U	**12**	**J**
4,4'-DDT	UG/KG	4.2	U	5.3	U	5	U	4.5	U
Aldrin	UG/KG	2.2	U	2.7	U	2.6	U	2.2	J
Alpha-BHC	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Alpha-Chlordane	UG/KG	2.2	U	2.7	U	2.6	U	5.7	J
Aroclor-1016	UG/KG	42	U	53	U	50	U	45	U
Aroclor-1221	UG/KG	85	U	110	U	100	U	91	U

Table A.1.2

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Matrix		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
Sample ID		SD45-1		SD45-2		SD45-3		SD45-4	
Sample Depth Interval (FT)		0-0.5		0-0.5		0-0.5		0-0.5	
Sample Date		11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type		SA		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI	
Sample Round									
Filtered		N		N		N		N	
Criteria									
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Aroclor-1232	UG/KG	42	U	53	U	50	U	45	U
Aroclor-1242	UG/KG	42	U	53	U	50	U	45	U
Aroclor-1248	UG/KG	42	U	53	U	50	U	45	U
Aroclor-1254	UG/KG	42	U	74		50	U	**580**	**J**
Aroclor-1260	UG/KG	42	U	53	U	50	U	45	U
Beta-BHC	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Delta-BHC	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Dieldrin	UG/KG	4.2	U	5.3	U	5	U	**7.4**	**J**
Endosulfan I	UG/KG	2.2	U	2.7	J	1.3	J	2.3	U
Endosulfan II	UG/KG	4.2	U	5.3	U	5	U	4.5	U
Endosulfan sulfate	UG/KG	4.2	U	5.3	U	5	U	4.5	U
Endrin	UG/KG	4.2	U	5.3	U	5	U	4.5	U
Endrin aldehyde	UG/KG	4.2	U	5.3	U	5	U	3.2	J
Endrin ketone	UG/KG	4.2	U	5.3	U	5	U	4.5	U
Gamma-BHC/Lindane	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Gamma-Chlordane	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Heptachlor	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Heptachlor epoxide	UG/KG	2.2	U	2.7	U	2.6	U	2.3	U
Methoxychlor	UG/KG	22	U	27	U	26	U	23	U
Toxaphene	UG/KG	220	U	270	U	260	U	230	U
Inorganics									
Aluminum	MG/KG	14,400		35,000		22,300		21,100	
Antimony	MG/KG	10.1	U	13.4	U	11.7	U	7.2	UJ
Arsenic	MG/KG	6.9		4.2		7.3		**16.1**	
Barium	MG/KG	85.4		308		187		176	
Beryllium	MG/KG	0.62	J	1.4		0.94	J	0.83	
Cadmium	MG/KG	0.76	J	**14.9**		**5.6**		**25.6**	**J**
Calcium	MG/KG	84,400		21,700		25,100		25,100	
Chromium	MG/KG	22.5		**48.4**		**31.4**		**31.8**	
Cobalt	MG/KG	11.2		19.7		12.9		13.2	
Copper	MG/KG	**63.9**		**814**		**323**		**241**	
Cyanide	MG/KG	0.61	U	0.68	U	0.74	U	0.68	U
Iron	MG/KG	25,600		50,500		32,600		33,200	
Lead	MG/KG	19.8		**101**		52.8		**72.9**	
Magnesium	MG/KG	9,720		10,200		7,630		7,510	
Manganese	MG/KG	458		692		616		935	
Mercury	MG/KG	**0.38**		**5.3**		**4.4**		**2.2**	**J**
Nickel	MG/KG	**40.1**		**67.7**		**41.6**		**44.6**	
Potassium	MG/KG	2,580		4,680		3,360		2,840	
Selenium	MG/KG	0.19	U	0.35	U	0.24	U	0.28	UJ
Silver	MG/KG	1.3	U	**5.8**		**3.1**		**2.5**	**J**
Sodium	MG/KG	208	J	377	J	146	J	130	J
Thallium	MG/KG	0.21	U	0.38	U	0.26	U	0.31	U
Vanadium	MG/KG	23.9		53.7		37.2		32.9	
Zinc	MG/KG	104		**755**		**312**		**329**	

Table A.1.3
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		MW45-4		MW45-4		MW45-4		MW45-4		MW45-4		MW5	
Sample ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		122000		122247		122248		MW45-4		OB108		MW5	
Matrix		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW	
Sample Date		2/1/1994		2/2/1994		2/1/1994		2/2/1994		2/3/1994		2/3/1994		4/9/1999		12/7/1999		12/7/1999		1/26/1994		6/18/1997		2/2/1994	
QC Type		SA		SA		SA		SA		SA		SA		SA		SA		DU		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI		ESI		ESI		RI		RI		RI		ESI		OB_Quarterly		ESI	
														1		2		2				0			
		N		N		N		N		N		N		N		N		N		N		N		N	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Volatile Organic Compounds																									
1,1,1-Trichloroethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,1,2,2-Tetrachloroethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,1,2-Trichloroethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,1-Dichloroethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,1-Dichloroethene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,2-Dichloroethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,2-Dichloroethene (total)	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
1,2-Dichloropropane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Acetone	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Benzene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Bromodichloromethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Bromoform	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Carbon disulfide	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Carbon tetrachloride	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Chlorobenzene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Chlorodibromomethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Chloroethane	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Chloroform	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Cis-1,3-Dichloropropene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Ethyl benzene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Methyl bromide	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Methyl butyl ketone	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Methyl chloride	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Methyl ethyl ketone	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Methyl isobutyl ketone	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Methylene chloride	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Styrene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Tetrachloroethene	µG/L	1	J	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Toluene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Total Xylenes	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Trans-1,3-Dichloropropene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Trichloroethene	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Vinyl chloride	µG/L	10	U	10	U	10	U	10	U	10	U	10	U							10	U			10	U
Semivolatile Organic Compounds																									
1,2,4-Trichlorobenzene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
1,2-Dichlorobenzene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
1,3-Dichlorobenzene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
1,4-Dichlorobenzene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2,2'-oxybis(1-Chloropropane)	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2,4,5-Trichlorophenol	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
2,4,6-Trichlorophenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2,4-Dichlorophenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2,4-Dimethylphenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2,4-Dinitrophenol	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
2,4-Dinitrotoluene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2,6-Dinitrotoluene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2-Chloronaphthalene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2-Chlorophenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2-Methylnaphthalene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2-Methylphenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
2-Nitroaniline	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
2-Nitrophenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
3,3'-Dichlorobenzidine	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
3-Nitroaniline	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
4,6-Dinitro-2-methylphenol	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
4-Bromophenyl phenyl ether	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
4-Chloro-3-methylphenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
4-Chloroaniline	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
4-Chlorophenyl phenyl ether	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
4-Methylphenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
4-Nitroaniline	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
4-Nitrophenol	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
Acenaphthene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Acenaphthylene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Anthracene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Benzo(a)anthracene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Benzo(a)pyrene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U

Table A.1.3
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		MW45-4		MW45-4		MW45-4		MW45-4		MW45-4		MW5	
Sample ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		122000		122247		122248		MW45-4		OB108		MW5	
Matrix		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW	
Sample Date		2/1/1994		2/2/1994		2/1/1994		2/2/1994		2/3/1994		2/3/1994		4/9/1999		12/7/1999		12/7/1999		1/26/1994		6/18/1997		2/2/1994	
QC Type		SA		SA		SA		SA		SA		SA		SA		SA		DU		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI		ESI		ESI		RI		RI		RI		ESI		OB_Quarterly		ESI	
														1		2		2				0			
		N		N		N		N		N		N		N		N		N		N		N		N	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Benzo(b)fluoranthene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Benzo(ghi)perylene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Benzo(k)fluoranthene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Bis(2-Chloroethoxy)methane	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Bis(2-Chloroethyl)ether	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Bis(2-Ethylhexyl)phthalate	µG/L	33		11	U	12		11		23		11	U							11	U			10	U
Butylbenzylphthalate	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Carbazole	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Chrysene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Dibenz(a,h)anthracene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Dibenzofuran	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Diethyl phthalate	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Dimethylphthalate	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Di-n-butylphthalate	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Di-n-octylphthalate	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Fluoranthene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Fluorene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Hexachlorobenzene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Hexachlorobutadiene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Hexachlorocyclopentadiene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Hexachloroethane	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Indeno(1,2,3-cd)pyrene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Isophorone	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Naphthalene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Nitrobenzene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
N-Nitroso-di-n-propylamine	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
N-Nitrosodiphenylamine	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Pentachlorophenol	µG/L	25	U	28	U	25	U	26	U	27	U	27	U							27	U			26	U
Phenanthrene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Phenol	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U
Pyrene	µG/L	10	U	11	U	10	U	10	U	11	U	11	U							11	U			10	U

Table A.1.3
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		MW45-4		MW45-4		MW45-4		MW45-4		MW45-4		MW5	
Sample ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		122000		122247		122248		MW45-4		OB108		MW5	
Matrix		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW	
Sample Date		2/1/1994		2/2/1994		2/1/1994		2/2/1994		2/3/1994		2/3/1994		4/9/1999		12/7/1999		12/7/1999		1/26/1994		6/18/1997		2/2/1994	
QC Type		SA		SA		SA		SA		SA		SA		SA		SA		DU		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI		ESI		ESI		RI		RI		RI		ESI		OB_Quarterly		ESI	
														1		2		2				0			
		N		N		N		N		N		N		N		N		N		N		N		N	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Herbicides																									
2,4,5-T	µG/L	0.11	U	0.12	U	0.11	U	0.12	U	0.11	U	0.11	U							0.11	U			0.11	U
2,4,5-TP/Silvex	µG/L	0.11	U	0.12	U	0.11	U	0.12	U	0.11	U	0.11	U							0.11	U			0.11	U
2,4-D	µG/L	1.1	U	1.2	U	1.1	U	1.2	U	1.1	U	1.1	U							1.1	U			1.1	U
2,4-DB	µG/L	1.1	U	1.2	U	1.1	U	1.2	U	1.1	U	1.1	U							1.1	U			1.1	U
Dalapon	µG/L	2.5	U	2.7	U	2.4	U	2.7	U	2.5	U	2.5	U							2.5	U			2.5	U
Dicamba	µG/L	0.11	U	0.12	U	0.11	U	0.12	U	0.11	U	0.11	U							0.11	U			0.11	U
Dichloroprop	µG/L	1.1	U	1.2	U	1.1	U	1.2	U	1.1	U	1.1	U							1.1	U			1.1	U
Dinoseb	µG/L	0.53	U	0.58	U	0.52	U	0.59	U	0.54	U	0.53	U							0.54	U			0.55	U
MCPA	µG/L	110	U	120	U	110	U	120	U	110	U	110	U							110	U			110	U
MCPP	µG/L	110	U	120	U	110	U	120	U	110	U	110	U							110	U			110	U
Explosives																									
1,3,5-Trinitrobenzene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
1,3-Dinitrobenzene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.067	J
2,4,6-Trinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
2,4-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
2,6-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
2-amino-4,6-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
4-amino-2,6-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
HMX	µG/L	0.5		0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
RDX	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
Tetryl	µG/L	0.13	U	0.13	U	0.13	U	0.13	U	0.13	UJ	0.13	U							0.13	U			0.13	U
Pesticides/PCBs																									
4,4'-DDD	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
4,4'-DDE	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
4,4'-DDT	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Aldrin	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Alpha-BHC	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Alpha-Chlordane	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Aroclor-1016	µG/L	1.4	U	1.1	U	1	U	1.2	U	1.1	U	1.2	U							1.1	UJ			1.1	U
Aroclor-1221	µG/L	2.7	U	2.3	U	2.1	U	2.4	U	2.2	U	2.4	U							2.2	UJ			2.2	U
Aroclor-1232	µG/L	1.4	U	1.1	U	1	U	1.2	U	1.1	U	1.2	U							1.1	UJ			1.1	U
Aroclor-1242	µG/L	1.4	U	1.1	U	1	U	1.2	U	1.1	U	1.2	U							1.1	UJ			1.1	U
Aroclor-1248	µG/L	1.4	U	1.1	U	1	U	1.2	U	1.1	U	1.2	U							1.1	UJ			1.1	U
Aroclor-1254	µG/L	1.4	U	1.1	U	1	U	1.2	U	1.1	U	1.2	U							1.1	UJ			1.1	U
Aroclor-1260	µG/L	1.4	U	1.1	U	1	U	1.2	U	1.1	U	1.2	U							1.1	UJ			1.1	U
Beta-BHC	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Delta-BHC	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Dieldrin	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Endosulfan I	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Endosulfan II	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Endosulfan sulfate	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Endrin	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Endrin aldehyde	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Endrin ketone	µG/L	0.14	U	0.11	U	0.1	U	0.12	U	0.11	U	0.12	U							0.11	UJ			0.11	U
Gamma-BHC/Lindane	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Gamma-Chlordane	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Heptachlor	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Heptachlor epoxide	µG/L	0.068	U	0.057	U	0.052	U	0.059	U	0.056	U	0.059	U							0.056	UJ			0.054	U
Methoxychlor	µG/L	0.68	U	0.57	U	0.52	U	0.59	U	0.56	U	0.59	U							0.56	UJ			0.54	U
Toxaphene	µG/L	6.8	U	5.7	U	5.2	U	5.9	U	5.6	U	5.9	U							5.6	UJ			5.4	U
Inorganics																									
Aluminum	µG/L	124	J	828		83.5	J	17,700		42	U	7,510		215		14.3	U	14.3	U	63,300		36.8		821	
Antimony	µG/L	24.3	J	23.1	J	52.1	J	49.6	J	26.8	J	36.7	J	2.2	U	2.7	U	2.7	U	21.6	UJ	2.8	U	28.1	J
Arsenic	µG/L	1.4	U	1.4	U	1.4	U	1.7	J	1.4	U	1.8	J	1.8	U	1.9	U	1.9	U	9.5	J	3.6	U	1.4	U
Barium	µG/L	56.5	J	50.8	J	25.5	J	195	J	27.2	J	62.1	J	24.4	J	28.2	J	28.4	J	751		23.4		82.8	J
Beryllium	µG/L	0.4	U	0.4	U	0.4	U	0.87	J	0.4	U	0.52	J	0.1	U	0.2	U	0.2	U	5		2	U	0.4	U
Cadmium	µG/L	2.2	J	2.1	U	2.1	U	3.8	J	2.9	J	3.2	J	0.3	U	0.3	U	0.3	U	2.1	U	4	U	2.1	U
Calcium	µG/L	118,000		94,600		91,700		152,000		232,000		211,000		144,000		177,000		181,000		660,000		112,000		123,000	
Chromium	µG/L	2.6	U	4.1	J	2.6	U	28.9		2.6	U	16.1		0.7	U	0.9	U	0.9	U	106		1.3	U	2.6	J
Cobalt	µG/L	4.4	U	5.3	J	4.4	U	11	J	4.4	U	14.6	J	1.5	U	2	U	2	U	94.4		1.4	U	4.4	U
Copper	µG/L	3.1	U	7.2	J	3.9	J	79.2		3.1	U	11.9	J	1	U	1.9	J	1.7	U	123		1.5		3.1	U
Cyanide	µG/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	10	UJ	10	UJ	5	U			5	U
Iron	µG/L	207		940		109		27,500		48.5	J	14,100		256		25.4	U	25.4	U	113,000		62.8		1,220	
Iron+Manganese	µG/L	211.4	J	963.7		111.9	J	27,884		1,449	J	14,725		263.1	J	13.8	J	13.7	J	117,640		67.8	J	1,275	
Lead	µG/L	0.71	J	0.66	J	0.73	J	15.7		0.71	J	9.5		0.9	U	1	U	1	U	75.6		2	U	1.1	J

Table A.1.3
Analytical Results of Groundwater Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		MW45-4		MW45-4		MW45-4		MW45-4		MW45-4		MW5	
Sample ID		MW1		MW2		MW3		MW4		MW45-2		MW45-3		122000		122247		122248		MW45-4		OB108		MW5	
Matrix		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW		GW	
Sample Date		2/1/1994		2/2/1994		2/1/1994		2/2/1994		2/3/1994		2/3/1994		4/9/1999		12/7/1999		12/7/1999		1/26/1994		6/18/1997		2/2/1994	
QC Type		SA		SA		SA		SA		SA		SA		SA		SA		DU		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI		ESI		ESI		RI		RI		RI		ESI		OB_Quarterly		ESI	
														1		2		2				0			
		N		N		N		N		N		N		N		N		N		N		N		N	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Magnesium	µG/L	26,400		15,700		15,800		31,600		57,800		77,900		31,400		36,500		37,400		73,500		24,200		27,700	
Manganese	µG/L	4.4	J	23.7		2.9	J	384		1,400		625		7.1	J	1.1	J	1	J	4,640		5	J	55	
Mercury	µG/L	0.04	U	0.04	U	0.04	U	1.8		0.04	U	0.08	J	0.1	UJ	0.1	UJ	0.1	UJ	0.29		0.2	U	0.04	U
Nickel	µG/L	4	U	4	U	4	U	43.9		10.2	J	30.7	J	1.4	U	1.7	U	1.7	U	209		2.2		4	U
Potassium	µG/L	910	U	1,050	J	904	U	6,540		9,660		18,700		2,460	J	2,660	J	2,870	J	13,900		2,180		907	U
Selenium	µG/L	0.99	J	0.7	U	0.7	U	1.9	J	2.5	J	1.9	J	1.8	U	2.4	UJ	2.4	UJ	0.7	U	3.1	U	1.5	J
Silver	µG/L	4.2	U	4.2	U	4.2	U	4.6	J	4.2	U	4.2	U	0.9	U	1.9	UJ	1.9	UJ	4.2	U	0.98		4.2	U
Sodium	µG/L	10,000		13,100		3,400	J	15,800		40,000		18,600		11,400		14,000		13,900		17,300		10,600		16,100	
Thallium	µG/L	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	3.4	J	2.7	U	2.7	U	1.2	U	4	U	1.2	U
Vanadium	µG/L	3.7	U	3.7	U	3.7	U	29.7	J	3.7	U	11.7	J	1.6	U	1.5	U	1.5	U	93.1		1.2	U	3.7	U
Zinc	µG/L	15.3	J	23		14	J	164		31.6		81.1		5.8	J	5.1	J	5.3	J	321		6.8		24.5	

Footnote:
and are evaluated and modified (if necessary) by during data
value.
[blank] = detect, i.e. detected chemical result value.
detected results excluding rejected results. Sample duplicate
highlighted, bolded and boxed
4) Criteria action level source document and web address.
obtained from the provided links.
http://www.dec.ny.gov/regulations/2652.html
http://water.epa.gov/drink/contaminants/index.cfm#List

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds
Loc ID		MW23-1	MW23-2	MW23-3	MW23-3	MW23-4	MW23-5	MW23-6
Matrix		GW	GW	GW	GW	GW	GW	GW
Sample ID		OBLM20001	OBLM20002	OBLM20003	OBLM20004	OBLM20005	OBLM20006	OBLM20007
Sample Date		11/21/2007	11/21/2007	11/21/2007	11/21/2007	11/21/2007	11/21/2007	11/28/2007
QC Type		SA	SA	SA	DU	SA	SA	SA
Study ID		LTM	LTM	LTM	LTM	LTM	LTM	LTM
Study Round		1	1	1	1	1	1	1
Parameter	**Unit**	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Copper	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Lead	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds
Loc ID		MW23-1	MW23-1	MW23-2	MW23-3	MW23-4	MW23-5	MW23-6
Matrix		GW	GW	GW	GW	GW	GW	GW
Sample ID		OBLM20008	OBLM20009	OBLM20010	OBLM20011	OBLM20012	OBLM20013	OBLM20014
Sample Date		2/26/2008	2/26/2008	2/25/2008	2/25/2008	3/3/2008	2/26/2008	2/26/2008
QC Type		SA	DU	SA	SA	SA	SA	SA
Study ID		LTM	LTM	LTM	LTM	LTM	LTM	LTM
Study Round		2	2	2	2	2	2	2
Parameter	**Unit**	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Copper	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Lead	UG/L	5 U	5 U	5 U	5 U	5.4	5 U	5 U

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds	
Loc ID		MW23-1		MW23-2		MW23-2		MW23-3		MW23-4		MW23-5		MW23-6	
Matrix		GW		GW		GW		GW		GW		GW		GW	
Sample ID		OBLM20015		OBLM20016		OBLM20017		OBLM20018		OBLM20019		OBLM20020		OBLM20021	
Sample Date		5/21/2008		5/21/2008		5/21/2008		5/21/2008		5/21/2008		5/21/2008		5/20/2008	
QC Type		SA		SA		DU		SA		SA		SA		SA	
Study ID		LTM		LTM		LTM		LTM		LTM		LTM		LTM	
Study Round		3		3		3		3		3		3		3	
Parameter	**Unit**	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Copper	UG/L	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Lead	UG/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds
Loc ID		MW23-1	MW23-2	MW23-3	MW23-4	MW23-4	MW23-5	MW23-6
Matrix		GW	GW	GW	GW	GW	GW	GW
Sample ID		OBLM20022	OBLM20023	OBLM20024	OBLM20025	OBLM20026	OBLM20027	OBLM20028
Sample Date		8/26/2008	8/26/2008	8/26/2008	8/25/2008	8/25/2008	8/25/2008	8/26/2008
QC Type		SA	SA	SA	SA	DU	SA	SA
Study ID		LTM	LTM	LTM	LTM	LTM	LTM	LTM
Study Round		4	4	4	4	4	4	4
Parameter	**Unit**	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Copper	UG/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Lead	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds	
Loc ID		MW23-1		MW23-2		MW23-3		MW23-4		MW23-5		MW23-5		MW23-6	
Matrix		GW		GW		GW		GW		GW		GW		GW	
Sample ID		OBLM20029		OBLM20030		OBLM20031		OBLM20032		OBLM20033		OBLM20034		OBLM20035	
Sample Date		8/3/2010		8/3/2010		8/2/2010		8/2/2010		8/2/2010		8/2/2010		8/3/2010	
QC Type		SA		SA		SA		SA		SA		DU		SA	
Study ID		LTM		LTM		LTM		LTM		LTM		LTM		LTM	
Study Round		5		5		5		5		5		5		5	
Parameter	**Unit**	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Copper	UG/L	20	U	20	U	20	U	20	U	1.62	U	20	U	20	U
Lead	UG/L	1.87	U	1.87	U	1.87	U	2.7	J	1.87	U	2.4	J	3.6	J

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds	OB Grounds
Loc ID		MW23-1	MW23-2	MW23-3	MW23-4	MW23-5	MW23-6	MW23-6
Matrix		GW	GW	GW	GW	GW	GW	GW
Sample ID		OBLM20036	OBLM20037	OBLM20038	OBLM20039	OBLM20040	OBLM20041	OBLM20042
Sample Date		10/5/2011	10/5/2011	10/4/2011	10/5/2011	10/4/2011	10/5/2011	10/5/2011
QC Type		SA	SA	SA	SA	SA	SA	DU
Study ID		LTM	LTM	LTM	LTM	LTM	LTM	LTM
Study Round		6	6	6	6	6	6	6
Parameter	**Unit**	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual	Value Qual
Copper	UG/L	25 U	25 U	25 U	0.63 U	25 U	25 U	25 U
Lead	UG/L	1.07 U	1.07 U	1.07 U	1.07 U	1.1 J	1.2 J	1.5 J

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds	
Loc ID		MW23-1		MW23-2		MW23-3		MW23-3		MW23-4		MW23-5		MW23-6	
Matrix		GW		GW		GW		GW		GW		GW		GW	
Sample ID		OBLM20043		OBLM20044		OBLM20045		OBLM20046		OBLM20047		OBLM20048		OBLM20049	
Sample Date		10/9/2012		10/9/2012		10/8/2012		10/8/2012		10/8/2012		10/8/2012		10/8/2012	
QC Type		SA		SA		SA		DU		SA		SA		SA	
Study ID		LTM		LTM		LTM		LTM		LTM		LTM		LTM	
Study Round		7		7		7		7		7		7		7	
Parameter	**Unit**	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Copper	UG/L	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U
Lead	UG/L	4	U	4	U	4	U	4	U	4	U	4	U	4	U

Table A.1.4
Groundwater Analytical Data
OB Grounds LTM 2012 Annual Report
Seneca Army Depot Activity

Area		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds		OB Grounds	
Loc ID		MW23-1		MW23-2		MW23-3		MW23-4		MW23-4		MW23-5		MW23-6	
Matrix		GW		GW		GW		GW		GW		GW		GW	
Sample ID		OBLM20050		OBLM20051		OBLM20052		OBLM20053		OBLM20054		OBLM20055		OBLM20056	
Sample Date		12/10/2013		12/11/2013		12/10/2013		12/10/2013		12/10/2013		12/10/2013		12/10/2013	
QC Type		SA		SA		DU		SA		DU		SA		SA	
Study ID		LTM		LTM		LTM		LTM		LTM		LTM		LTM	
Study Round		8		8		8		8		8		8		8	
Parameter	**Unit**	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Copper	UG/L	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U
Lead	UG/L	4	U	4	U	4	U	4	U	4	U	4	U	4	U

Table A.1.5

	01/08/92 MW-5	01/08/92 MW-5 Filtered	03/01/93 MW-5	01/14/92 MW-6	01/14/92 MW-6 Filtered	03/02/93 MW-6	01/10/92 MW-7	01/10/92 MW-7 Filtered
VOCs (ug/L)								
Acetone	9 J		5 U	10 U		5 U	10 U	
Semivolatiles (ug/L)								
Diethylphthalate	10 U		10 U	11 U		10 U	11 U	
Di-n-butylphthalate	10 U		10 U	11 U		10 U	11 U	
Di-n-octylphthalate	10 U		10 U	11 U		10 U	11 U	
Explosives (ug/L)								
RDX	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
2, 4, 6 - Trinitrotoluene	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
2, 6 - Dinitrotoluene	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
Metals (ug/L)								
Aluminum	3540 J	24.5 U	2180	5490 J	24.5 U	3440	27500	24.4 U
Antimony	55.8 U	53.2 U	54 U	53.2 U	53.3 U	53.7 U	55.8 U	53 U
Arsenic	3.5 U	3.5 U	1.7 U	3.5 U	3.5 U	1.7 U	3.5 U	3.5 U
Barium	71.3 J	44 R	69.4 J	108 J	68.6 J	94.1 J	253	43.6 R
Beryllium	1.2 U	1.1 UR	0.3 U	1.1 U	1.3 R	0.3 U	2.5 R	1.1 UR
Cadmium	2.9 U	3 U	3.1 U	3 U	3 U	3.1 U	2.9 U	3 U
Calcium	95500	98100	106000	110000	91300	108000	122000	84900
Chromium	7.1 R	6.2 UR	3.9 R	9.2 J	6.2 UR	4.9 J	36.7 R	6.3 R
Cobalt	19.9 U	20.4 U	5 U	20.4 U	20.5 U	5 U	19.9 U	20.4 U
Copper	24.7 J	10.2 U	2.4 R	12 J	10.2 U	5.6 J	42.7	10.1 U
Iron	4960	7 UR	2420	7660 J	7 UR	4550	39600	6.9 UR
Lead	1.4 J	1.2 U	1.1 J	3.4	1.2 U	2.3 J	37.3	1.2 U
Magnesium	20600	22000	26100	38300	29200	33600	28700	17600
Manganese	71.6 J	5.9 J	51.2	151	5.5 J	77.9	707 J	4.8 U
Mercury	0.18 R	0.17 R	0.06 U	0.17 R	0.15 R	0.06 U	0.23 R	0.16 R
Nickel	15.9 U	14.7 U	4.3 J	17.8 J	14.8 U	8.5 J	59.9	14.7 U
Potassium	1280 J	288 U	1170 J	2280 J	561 J	2130 J	5600	287 U
Selenium	1 U	1.8 J	1.1 U	1.8 J	3 J	1.2 J	1 U	1 J
Silver	9.1 U	3.4 U	3.2 U	6.2 R	3.4 U	3.2 U	9.1 U	3.4 U
Sodium	17300	18400	17400	15700	14000	9900	5190	5490
Vanadium	30.5 U	9.5 U	4.3 R	13 J	9.5 U	5.9 J	34.2 J	9.4 U
Zinc	27.3 R	8.5 U	11.2 R	41.5 R	8.5 U	21.3 R	133	8.4 U
Cyanide	10 UJ		10 U	10 U		10 U	10 UJ	

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	03/01/93 MW-7	01/15/92 MW-8	01/15/92 MW-8 Filtered	01/15/92 MW-8A	01/15/92 MW-8A Filtered	03/01/93 MW-8	01/09/92 MW-9	01/09/92 MW-9 Filtered
VOCs (ug/L)								
Acetone	5 U	10 U		10 U		5 U	10 U	
Semivolatiles (ug/L)								
Diethylphthalate	10 U	11 U		11 U		10 U	10 U	
Di-n-butylphthalate	10 U	11 U		11 U		10 U	10 U	
Di-n-octylphthalate	10 U	11 U		11 U		10 U	10 U	
Explosives (ug/L)								
RDX	0.12 U	0.12 U		0.12 U		0.12 U	0.12 U	
2, 4, 6 - Trinitrotoluene	0.12 U	0.12 U		0.12 U		0.12 U	0.12 U	
2, 6 - Dinitrotoluene	0.12 U	0.12 U		0.12 U		0.12 U	0.12 U	
Metals (ug/L)								
Aluminum	1130	52800 J	97.9 U	82500 J	97.6 U	564	5880 J	24.5 U
Antimony	53.8 U	52.9 U	53.2 U	53 U	53 U	53.8 U	55.7 U	53.3 U
Arsenic	1.7 U	11.3	3.5 U	15.8	3.5 U	1.7 U	3.5 U	3.5 U
Barium	58.3 J	827 J	14.8 J	1410 J	16.1 J	20.3 J	181 J	46.5 R
Beryllium	0.3 U	2.6 R	1.2 U	3.7 R	1.2 U	0.3 U	1.9 R	1.1 UR
Cadmium	3.1 U	10.7 R	3 U	15.5 R	3 U	3.1 U	2.9 U	3 U
Calcium	74500	454000 J	355000	510000 J	331000	295000	169000	168000
Chromium	2.9 R	81 J	6.2 U	133 J	6.2 U	2 U	9.4 R	6.2 UR
Cobalt	5 U	65	19.9 U	83.1	19.9 U	5 U	19.9 U	20.5 U
Copper	1.9 U	53.1 J	14.4 U	87.7 J	14.4 U	1.9 U	14.4 U	10.2 U
Iron	1970	83100 J	17 U	137000 J	17 U	688	7640	7 UR
Lead	2.3 J	86.3 J	1.2 U	147 J	1.2 U	0.89 U	4.6	1.2 U
Magnesium	17500	98200 J	74100	110000 J	66900	67700	40800	41000
Manganese	52.9	1780 J	10.3 J	2330 J	10.8 J	17.7	200 J	14.8 J
Mercury	0.06 U	0.19 R	0.03 U	0.22 R	0.03 U	0.06 U	0.19 R	0.17 R
Nickel	3.5 U	148 J	15.9 U	232 J	15.9 U	7 J	16.7 J	14.8 U
Potassium	455 J	12000	2850 J	14600	2500 J	1310 J	2570 J	1690 J
Selenium	1.1 U	5 U	1 U	5 U	1 U	1.1 U	1 U	2 J
Silver	3.2 U	6.5 R	9.1 U	5.9 R	9 U	3.2 U	9.1 U	3.4 U
Sodium	3650 J	18200	18900	17900	17700	17900	13000	14000
Vanadium	2.5 R	75.8	30.5 U	115	30.4 U	2.2 R	30.4 U	9.5 U
Zinc	10.9 R	179 J	13.4 U	302 J	13.4 U	7.4 R	29.3 R	8.5 U
Cyanide	10 U	10 U		10 U		10 U	10 UJ	

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/10/92 MW-10	01/10/92 MW-10 Filtered	03/03/93 MW-10	01/15/92 MW-11	03/10/30 MW-11	01/15/92 MW-12	01/15/92 MW-12 Filtered	03/08/93 MW-12
VOCs (ug/L)								
Acetone	10 U		5 U	10 U	5 U	10 U		5 U
Semivolatiles (ug/L)								
Diethylphthalate	11 U		10 U	11 U	10 U	11 U		10 U
Di-n-butylphthalate	11 U		10 U	11 U	10 U	11 U		10 U
Di-n-octylphthalate	11 U		10 U	11 U	10 U	11 U		10 U
Explosives (ug/L)								
RDX	0.12 U		0.12 U	0.12 U	0.12 U	0.12 U		0.12 U
2, 4, 6 - Trinitrotoluene	0.12 U		0.12 U	0.12 U	0.12 U	0.12 U		0.12 U
2, 6 - Dinitrotoluene	0.12 U		0.12 U	0.12 U	0.12 U	0.12 U		0.12 U
Metals (ug/L)								
Aluminum	72200	24.5 U	7350	222 J	75.2 J	37400	97.5 U	574
Antimony	55.6 U	53.2 U	53.8 U	53.1 U	54 U	53 U	52.9 U	54 U
Arsenic	3.5 U	3.5 U	1.7 U	3.5 U	1.7 U	3.5 J	3.5 U	1.7 U
Barium	638	53.1 R	86.1 J	124 J	92.4 J	361	107 J	105 J
Beryllium	4.3 R	1.1 UR	0.3 U	1.1 U	0.3 U	2.1 R	1.2 U	0.3 U
Cadmium	7.1	3 U	3.1 U	3 U	3.1 U	6.3 R	3 U	3.1 U
Calcium	223000	172000	162000	198000	186000	97400	85600	95000
Chromium	96.7	6.2 UR	9.6 J	6.2 U	2.1 J	53.4	6.1 U	2 U
Cobalt	98.6	20.4 U	5.6 J	20.4 U	5 U	48.2 J	19.8 U	5 U
Copper	80.3	10.2 U	7 J	10.1 U	4 R	64.8	16.5 J	2.1 R
Iron	108000	7 UR	8830	486 J	151 R	55200 J	17 U	827
Lead	57.9	1.2 U	4.9	1.2 U	0.9 U	46	1.2 U	0.97 J
Magnesium	36800	19300	20100	32400	30000	69100	51500	74400
Manganese	3970 J	15.7	160	23.8	73.1	1030	3.2 U	17.5
Mercury	0.27 R	0.16 R	0.07 R	0.16 R	0.06 U	0.26 R	0.03 U	0.06 U
Nickel	139	14.7 U	12.9 J	14.7 U	4.5 J	90.3	15.9 U	3.5 U
Potassium	11000	1330 J	2440 J	1470 J	935 J	11300	6160	6670
Selenium	10 U	1 U	1.1 U	1 U	1.1 U	1 U	2.8 J	1.1 U
Silver	9 U	3.4 U	3.2 U	7.4 R	3.2 U	8.1 R	9 U	3.2 U
Sodium	13700	13100	10000	33200	30700	23800	23200	18100
Vanadium	103	9.5 U	10.2 J	9.4 U	2.1 U	44.9 J	30.3 U	2.1 U
Zinc	291	8.5 U	32.8	8.4 U	3.8 R	194	13.4 U	41.3
Cyanide	10 UJ		10 U	10 U	14.5	10 U		10 U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/09/92 MW-13	01/09/92 MW-13 Filtered	01/15/92 MW-14	01/15/92 MW-14 Filtered	01/15/92 MW-14A	01/15/92 MW-14A Filtered	03/10/93 MW-14	01/09/92 MW-15
VOCs (ug/L)								
Acetone	10 U		10 U		10 U		5 U	10 U
Semivolatiles (ug/L)								
Diethylphthalate	10 U		10 U		11 U		10 U	11 U
Di-n-butylphthalate	10 U		10 U		11 U		0.5 J	11 U
Di-n-octylphthalate	10 U		10 U		11 U		0.9 J	11 U
Explosives (ug/L)								
RDX	0.6		0.12 U		0.12 U		0.12 U	0.082 J
2, 4, 6 - Trinitrotoluene	0.12 U		0.12 U		0.12 U		0.12 U	0.12 U
2, 6 - Dinitrotoluene	0.12 U		0.12 U		0.12 U		0.12 U	0.12 U
Metals (ug/L)								
Aluminum	12200	24.4 U	29100 J	118 J	32000 J	97.5 U	5590 J	30700
Antimony	55.5 U	52.9 U	53.3 U	53.1 U	52.9 U	53 U	53.9 U	55.5 U
Arsenic	3.5 U	3.5 U	6.2 J	3.5 U	4.9 J	3.5 U	1.7 U	6.2 J
Barium	160 J	68.2 J	801	51 J	768	51.8 J	93.2 J	481
Beryllium	2.2 R	1.1 UR	1.1 U	1.2 U	1.4 R	1.2 U	0.91 J	2.5 R
Cadmium	2.9 U	3 U	5.8 R	3 U	5.7 R	3 U	3.1 U	3.4 J
Calcium	142000	140000	188000	167000	189000	175000	169000	293000
Chromium	13.8 R	6.1 UR	43.8	6.2 U	46.1	6.2 U	5.6 J	50 R
Cobalt	19.8 U	20.3 U	32.2 J	19.9 U	32.3 J	19.8 U	5 U	28.6 J
Copper	25.4	10.1 U	57.9	14.4 U	61.6	15.2 J	12.7 J	67.4
Iron	13700	6.9 UR	46300 J	17 U	50500 J	17 U	7380 J	49600
Lead	32	1.2 U	60.1	1.2 U	63.5	1.2 U	85.6	123
Magnesium	27100	25000	43800 J	32700	44200 J	32800	36200	54900
Manganese	175 J	4.8 U	765	3.2 U	807	3.2 U	87.1	564 J
Mercury	0.22 R	0.16 R	0.26 R	0.03 U	0.25 R	0.05 J	0.12 R	0.25 R
Nickel	22.4 J	14.7 U	67.5	15.9 U	85.5	15.9 U	9.1 J	71.8
Potassium	3330 J	714 J	6170	697 J	7430	889 J	2930 J	7100
Selenium	1 U	1.5 J	4.4 J	1 U	4.2 J	1 U	2.3 J	1.5 J
Silver	9 U	3.4 U	6 R	9 U	4.9 R	9 U	3.2 U	9 U
Sodium	16000	16700	36100	40400	38400	40700	35900	31600
Vanadium	31.1 J	9.4 U	42.3 J	30.4 U	51.4	30.4 U	7.8 J	34.1 J
Zinc	86.1	8.4 U	163	13.4 U	154	13.4 U	39.1	169
Cyanide	10 UJ		10 U		10 U		10 U	10 UJ

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/09/92 MW-15 Filtered	03/02/93 MW-15	01/14/92 MW-16	01/14/92 MW-16 Filtered	01/14/92 MW-16A	01/14/92 MW-16A Filtered	03/10/93 MW-16	01/17/92 MW-17
VOCs (ug/L)								
Acetone		5 U	10 U		10 U		5 U	10 U
Semivolatiles (ug/L)								
Diethylphthalate		10 U	11 U		11 U		10 U	11 U
Di-n-butylphthalate		10 U	11 U		11 U		10 U	11 U
Di-n-octylphthalate		10 U	11 U		11 U		10 U	11 U
Explosives (ug/L)								
RDX		0.12 U	0.12 U		0.12 U		0.12 U	0.12 U
2, 4, 6 - Trinitrotoluene		0.12 U	0.12 U		0.12 U		0.12 U	0.12 U
2, 6 - Dinitrotoluene		0.12 U	0.12 U		0.12 U		0.12 U	0.12 U
Metals (ug/L)								
Aluminum	24.4 U	4440	6170 J	24.5 U	5960 J	24.5 U	930 J	28200
Antimony	52.9 U	53.8 U	53 U	53.2 U	53.1 U	53.3 U	54 U	65.7
Arsenic	3.5 U	1.7 U	3.5 U	3.5 U	3.5 U	3.5 U	1.7 U	3.5 U
Barium	39.7 R	145 J	86.9 J	33.9 R	87.5 J	32.4 R	34.4 J	355
Beryllium	1.1 UR	0.3 U	1.1 U	1.4 R	1.1 U	1.5 R	0.3 U	2.8 R
Cadmium	3 U	3.1 U	3 U	3 U	3 U	3 U	3.1 U	3.6 J
Calcium	248000	241000	126000	129000	123000	122000	132000	126000
Chromium	7.7 R	5.9 J	7.9 J	6.2 UR	7.8 J	6.2 UR	3.2 J	40.7
Cobalt	20.3 U	5 U	20.3 U	20.4 U	20.4 U	20.5 U	5 U	37.2 J
Copper	10.1 U	10.8 J	10.1 U	10.2 U	10.1 U	10.2 U	2.7 J	66.9
Iron	6.9 UR	5880	7930 J	7 UR	8130 J	7 UR	1290 J	42200
Lead	1.2 U	10.5	9.1	1.2 U	11.3	1.2 U	1.6 J	42.5
Magnesium	47900	48900	26900	23200	26900	22700	24900	25400
Manganese	19.9	66.2	146	9.5 J	146	8.3 J	31.1	2240
Mercury	0.15 R	0.06 U	0.15 R	0.2 R	0.15 R	0.3 R	0.08 R	0.03 U
Nickel	14.7 U	10.3 J	14.7 U	14.8 U	19.7 J	14.8 U	4.8 J	109
Potassium	1450 J	2060 J	2890 J	970 J	2530 J	883 J	1270 J	6360
Selenium	1.7 J	1.1 U	4.8 J	4.2 J	4.6 J	4.8 J	1.4 J	0.99 U
Silver	3.4 U	3.2 U	5.3 R	3.4 U	4.4 R	3.4 U	3.2 U	3.4 U
Sodium	30700	23700	9920	10400	9830	10500	4830 J	7840
Vanadium	9.4 U	6.9 J	10.7 J	9.5 U	11 J	9.5 U	3.1 J	37.3 J
Zinc	10.3 J	38.3	41.4 R	8.5 U	39.8 R	8.5 U	14.3 R	154
Cyanide		10 U	10 U		10 U		10 U	10 U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/17/92 MW-17 Filtered	03/09/93 MW-17	01/13/92 MW-18	01/13/92 MW-18 Filtered	01/13/92 MW-18A	01/13/92 MW-18A Filtered	03/09/93 MW-18	03/09/93 MW-18D
VOCs (ug/L)								
Acetone		5 U	10 U		10 U		5 U	5 U
Semivolatiles (ug/L)								
Diethylphthalate		1 J	10 U		10 U		10 U	10 U
Di-n-butylphthalate		10 U	10 U		10 U		2 J	10 U
Di-n-octylphthalate		10 U	10 U		10 U		10 U	10 U
Explosives (ug/L)								
RDX		0.12 U	0.12 U		0.12 U		0.12 U	0.12 U
2, 4, 6 - Trinitrotoluene		0.12 U	0.12 U		0.12 U		0.12 U	0.12 U
2, 6 - Dinitrotoluene		0.12 U	0.12 U		0.12 U		0.12 U	0.12 U
Metals (ug/L)								
Aluminum	97.3 U	5000	9100 J	24.4 U	8660 J	24.6 U	1400	1210
Antimony	52.9 U	54 U	56.8 J	52.9 U	55.8 U	61.3	53.9 U	53.7 U
Arsenic	3.5 U	1.7 U	3.5 U	3.5 U	3.5 U	3.5 U	1.7 U	1.7 U
Barium	78 J	104 J	195 J	15.9 R	182 J	14.6 R	39.9 J	36.5 J
Beryllium	1.2 U	0.37 J	2 R	1.1 UR	2.1 R	1.1 UR	0.3 U	0.3 U
Cadmium	3 U	3.1 U	2.9 U	3 U	2.9 U	3 U	3.1 U	3.1 U
Calcium	103000	79500	143000	131000	140000	130000	107000	113000
Chromium	6.1 U	7.9 J	11.8 R	6.1 UR	10.9 R	8 R	2 U	2 U
Cobalt	19.8 U	5 U	19.9 U	20.3 U	19.9 U	20.5 U	5 U	5 U
Copper	16.2 J	7.6 R	14.4 U	10.1 U	14.4 U	10.2 U	2.7 R	4.1 R
Iron	16.9 U	5640	13000 J	6.9 UR	11700 J	7 UR	1550	1110
Lead	1.2 U	5.3	11.4	1.2 U	10.6	1.2 U	1.5 J	1 J
Magnesium	14900	13600	27000	24500	26500	24500	21200	22200
Manganese	3.2 U	198	289 J	110	271 J	108	155	148
Mercury	0.04 J	0.06 U	0.16 R	0.16 R	0.16 R	0.17 R	0.06 U	0.06 U
Nickel	15.8 U	13.1 J	22.9 J	14.7 U	17.1 J	14.8 U	5.2 J	3.5 U
Potassium	629 U	1410 J	4130 J	1470 J	3870 J	1670 J	753 J	702 J
Selenium	1.3 J	1.1 U	1.5 J	1 U	2.9 J	1.6 J	1.2 J	1.1 U
Silver	9 U	3.2 U	9 U	3.4 U	9.1 U	3.4 U	3.2 U	3.2 U
Sodium	6450	3720 J	28300	28100	28500	27500	19100	20200
Vanadium	30.3 U	8.9 J	30.4 U	9.4 U	30.5 U	9.5 U	2.6 J	2.1 U
Zinc	13.4 U	53.1	45.5	8.4 U	46.6	10.5 J	19.6 R	21.1 R
Cyanide		10 U	10 UJ		10 UJ		10 U	10 U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/16/92 MW-19	01/16/92 MW-19 Filtered	03/04/93 MW-19	01/08/92 MW-21	01/08/92 MW-21 Filtered	03/01/93 MW-21	01/13/92 MW-22	01/13/92 MW-22 Filtered
VOCs (ug/L)								
Acetone	10 U		5 U	10 U		5 U	10 U	
Semivolatiles (ug/L)								
Diethylphthalate	11 U		10 U	10 U		10 U	10 U	
Di-n-butylphthalate	11 U		10 U	10 U		10 U	10 U	
Di-n-octylphthalate	11 U		10 U	10 U		10 U	10 U	
Explosives (ug/L)								
RDX	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
2, 4, 6 - Trinitrotoluene	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
2, 6 - Dinitrotoluene	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
Metals (ug/L)								
Aluminum	243000	97.5 U	40200	1880 J	24.4 U	62.5 U	13100	24.4 U
Antimony	52.9 U	53 U	53.9 U	55.9 U	52.9 U	54 U	55.8 U	53 U
Arsenic	4.1 J	3.5 U	8 J	3.5 U	3.5 U	1.7 U	3.5 U	3.5 U
Barium	2230	40.6 J	348	47.5 J	25.4 R	32.6 J	154 J	22.5 R
Beryllium	12.8 R	1.2 U	2.4 J	1.6 R	1.1 UR	0.3 U	2 R	1.1 UR
Cadmium	51.9	3 U	3.1 U	2.9 U	3 U	3.1 U	2.9 U	3 U
Calcium	2000000	183000	279000	94100	91900	92100	121000	106000
Chromium	408	6.1 U	58.9	6.2 U	6.4 R	2 U	18.7 R	6.2 UR
Cobalt	208	19.8 U	28 J	20 U	20.3 U	5 U	19.9 U	20.4 U
Copper	525	15.2 J	69.5	14.5 U	10.1 U	1.9 U	30	10.1 U
Iron	469000 J	17 U	58000	2720	6.9 UR	39.7 R	19100	7 UR
Lead	141	1.2 U	35.7	1.8 J	1.2 U	0.9 U	14.1	1.2 U
Magnesium	227000	54500	80300	12200	12800	12900	18800	15400
Manganese	6980	105	949	232 J	196	10.1 J	239 J	29.6
Mercury	0.49 R	0.03 U	0.15 J	0.15 R	0.15 R	0.06 U	0.17 R	0.17 R
Nickel	642	15.9 U	98	16 U	14.7 U	3.5 U	33.2 J	14.7 U
Potassium	25400	4660 J	8450	3050 J	2530 J	1370 J	4250 J	541 J
Selenium	10 U	1.1 J	1.1 U	1 U	1.2 J	1.2 J	4.4 J	3.6 J
Silver	5.7 R	9 U	3.2 U	9.1 U	3.4 U	3.2 U	9.1 U	3.4 U
Sodium	107000	112000	80100	18400	17900	21500	4400 J	4330 J
Vanadium	324	30.3 U	57.5	30.6 U	9.4 U	2.1 U	30.5 U	9.4 U
Zinc	3260	67.4	627	15.1 R	8.4 U	4 R	67.8	9.1 J
Cyanide	10 U		10 U	10 UJ		10 U	10 UJ	

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	03/09/93 MW-22	01/14/92 MW-23	01/14/92 MW-23 Filtered	03/08/93 MW-23	01/14/92 MW-23RE	01/15/92 MW-24	01/15/92 MW-24 Filtered	03/03/93 MW-24
VOCs (ug/L)								
Acetone	5 U	10 UJ		5 U	10 UJ	10 U		5 U
Semivolatiles (ug/L)								
Diethylphthalate	10 U	11 U		10 U		11 U		10 U
Di-n-butylphthalate	10 U	11 U		10 U		11 U		10 U
Di-n-octylphthalate	10 U	11 U		10 U		11 U		10 U
Explosives (ug/L)								
RDX	0.12 U	0.12 U		0.12 U		0.12 U		0.12 U
2, 4, 6 - Trinitrotoluene	0.12 U	0.12 U		0.12 U		0.21		0.12 U
2, 6 - Dinitrotoluene	0.12 U	0.12 U		0.12 U		0.12 U		0.12 U
Metals (ug/L)								
Aluminum	111 J	3350 J	24.5 U	98.2 J		23500	97.4 U	508
Antimony	54.1 U	53 U	53.2 U	53.9 U		53.1 U	52.9 U	53.9 U
Arsenic	1.7 U	3.5 U	3.5 U	1.7 U		3.5 U	3.5 U	1.7 U
Barium	37.1 J	104 J	44.2 R	36.6 J		507	96.5 J	93.5 J
Beryllium	0.3 U	1.1 U	1.4 R	0.3 U		1.2 R	1.2 U	0.3 U
Cadmium	3.1 U	3 U	3 U	3.1 U		6 R	3 U	3.1 U
Calcium	115000	126000	123000	154000		153000	156000	155000
Chromium	2 U	6.2 U	6.2 UR	2 U		39.3	6.1	2 U
Cobalt	5 U	20.3 U	20.4 U	5 U		27.6 J	19.8 U	5 U
Copper	2.3 R	10.1 U	10.2 U	1.9 U		257	14.4 U	2.8 J
Iron	150 R	4960 J	7 UR	555		38900 J	16.9 U	659
Lead	0.9 U	5.2	1.2 U	0.89 U		275	1.2 U	2.5 J
Magnesium	16600	29000	25000	29500		57600	46300	56000
Manganese	28.6	141	79.9	80.7		472	3.2 U	8.8 J
Mercury	0.06 U	0.16 R	0.16 R	0.06 U		0.31 R	0.04 J	0.06 U
Nickel	4.5 J	17.8 J	14.7 U	3.5 U		70.7	15.9 U	4.4 J
Potassium	446 U	2500 J	1260 J	808 J		6840	3120 J	3660 J
Selenium	1.1 U	1 U	1.3 J	1.1 U		2.9 J	3.5 J	1.4 J
Silver	3.2 U	4.7 R	3.4 U	3.2 U		8.2 R	9 U	3.2 U
Sodium	4900 J	139000	134000	16100		39700	39900	39700
Vanadium	2.1 U	9.4 U	9.5 U	2.4 J		30.7 J	30.3 U	2.1 U
Zinc	7.4 R	18.4 R	8.5 U	5.3 R		423	13.4 U	18.9 R
Cyanide	10 U	10 U		10 U		10 U		10 U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	03/03/93 MW-24D	01/13/92 MW-25	01/13/92 MW-25 Filtered	03/03/93 MW-25	01/15/92 MW-27	01/15/92 MW-27 Filtered	03/08/93 MW-27	01/14/92 MW-28
VOCs (ug/L)								
Acetone	5 U	10 U		5 U	10 U		5 U	10 U
Semivolatiles (ug/L)								
Diethylphthalate	10 U	11 U		10 U	11 U		10 U	10 U
Di-n-butylphthalate	10 U	11 U		10 U	11 U		10 U	10 U
Di-n-octylphthalate	10 U	11 U		10 U	11 U		10 U	10 U
Explosives (ug/L)								
RDX	0.12 U	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U
2, 4, 6 - Trinitrotoluene	0.12 U	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U
2, 6 - Dinitrotoluene	0.12 U	0.12 U		0.12 U	0.12 U		0.12 U	0.087 J
Metals (ug/L)								
Aluminum	484	15200	24.5 U	622	68400	98.1 U	68.7 J	34700
Antimony	54 U	55.4 U	53.2 U	53.6 U	53.2 U	53.3 U	53.6 U	53.2 U
Arsenic	1.7 U	3.5 U	3.5 U	1.7 U	11.5	3.5 U	1.7 U	4.2 J
Barium	90.5 J	206	36.5 R	56.7 J	734	75.5 J	80.8 J	411
Beryllium	0.3 U	2.2 R	1.1 UR	0.3 U	2.8 R	1.2 U	0.3 U	1.8 R
Cadmium	3.1 U	2.9 U	3 U	3.1 U	14.1 R	3 U	3.1 U	6 R
Calcium	152000	130000	106000	86900	208000	97400	92400	172000
Chromium	2 U	18 R	6.2 UR	2 U	118	6.2 U	2 U	53.9
Cobalt	5 U	19.8 U	20.4 U	5 U	58.1	20 U	5 U	24.6 J
Copper	2.8 J	19.3 J	10.2 U	1.9 U	128	16.1 J	1.9 U	37.9
Iron	676	23000	7 UR	701	127000 J	17.1 U	82.4 R	50800 J
Lead	2.8 J	18	1.2 U	0.9 U	118	1.2 U	0.89 U	34.9
Magnesium	54900	25000	18600	16400	93800	60700	70600	44600
Manganese	11.3 J	281 J	34.3	28.7	1470 J	93.7	84.3	700 J
Mercury	0.06 U	0.19 R	0.15 R	0.06 U	0.24 R	0.03 U	0.06 U	0.18 R
Nickel	3.5 U	28.4 J	14.8 U	3.5 U	196	16 U	3.5 U	81.6
Potassium	3560 J	4400 J	658 J	921 J	18100	8440	7420	10200
Selenium	1.6 J	1.9 J	1 U	1.1 U	5 U	3.4 J	1.1 U	5 U
Silver	3.2 U	9 U	3.4 U	3.2 U	5.2 R	9.1 U	3.2 U	6.8 R
Sodium	38800	3900 J	3760 J	2860 J	17900	18300	18300	15300
Vanadium	2.1 U	30.3 U	9.5 U	2.3 J	107	30.5 U	2.1 U	45.3 J
Zinc	9.7 R	55.3	8.5 U	5.5 R	274	13.5 U	4.3 R	108 R
Cyanide	10 U	10 UJ		10 U	10 UJ		10 U	10 UJ

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/14/92 MW-28 Filtered	03/02/93 MW-28	01/14/92 MW-29	01/14/92 MW-29 Filtered	03/02/93 MW-29	01/09/92 MW-30	01/09/92 MW-30 Filtered	03/10/93 MW-30
VOCs (ug/L)								
Acetone		15	10 U		5 U	10 U		5 U
Semivolatiles (ug/L)								
Diethylphthalate		10 U	11 U		10 U	10 U		10 U
Di-n-butylphthalate		10 U	11 U		10 U	10 U		10 U
Di-n-octylphthalate		10 U	11 U		10 U	10 U		10 U
Explosives (ug/L)								
RDX		0.12 U	0.12 U		0.12 U	0.12 U		0.12 U
2, 4, 6 - Trinitrotoluene		0.12 U	0.12 U		0.12 U	0.12 U		0.12 U
2, 6 - Dinitrotoluene		0.12 U	0.12 U		0.12 U	0.12 U		0.12 U
Metals (ug/L)								
Aluminum	24.5 U	598	12600	24.4 U	529	1440 J	24.5 U	62.1 U
Antimony	53.3 U	54.1 U	53 U	52.9 U	53.6 U	58.3 J	53.1 U	53.7 U
Arsenic	3.5 U	1.7 U	3.5 U	3.5 U	1.7 U	3.5 U	3.5 U	1.7 U
Barium	53.9 R	59.5 J	166 J	78.1 J	76.8 J	94.2 J	74.9 J	81.4 J
Beryllium	1.2 R	0.3 U	1.1 U	1.5 R	0.3 U	1.8 R	1.1 UR	0.3 U
Cadmium	3 U	3.1 U	3 U	3 U	3.1 U	2.9 U	3 U	3.1 U
Calcium	116000	53900	137000	116000	108000	164000	159000	161000
Chromium	6.2 UR	2 U	18.5	6.1 UR	2 U	6.2 U	6.2 UR	2 U
Cobalt	20.4 U	5 U	20.3 U	20.3 U	5 U	19.9 U	20.4 U	5 U
Copper	10.2 U	1.9 U	27.2	10.1 U	1.9 U	14.4 U	10.1 U	1.9 U
Iron	7 UR	56.8 J	19400 J	6.9 UR	609	1870	7 UR	21.7 U
Lead	1.2 U	0.9 U	9.2	1.2 U	0.9 U	1.3 J	1.2 U	0.89 U
Magnesium	24500	2040 J	39800	29700	29000	23800	24200	25200
Manganese	85.9	1.5 J	432 J	4.8 U	16.1	39.8 R	16.8	7.2 J
Mercury	0.2 R	0.06 U	0.16 R	0.17 R	0.06 U	0.15 R	0.3 R	0.06 U
Nickel	14.8 U	3.5 U	35.3 J	14.7 U	3.5 U	15.9 U	14.7 U	3.5 U
Potassium	2220 J	11000	3700 J	592 J	966 J	996 J	697 J	443 U
Selenium	2 J	1.1 U	2 J	1.9 J	1.1 U	1.1 J	1.3 J	1.1 U
Silver	5.7 J	3.2 U	6.1 R	3.4 U	3.2 U	9 U	3.4 U	3.2 U
Sodium	15000	56800	14900	14000	11200	17500	17800	17800
Vanadium	9.5 U	5.1 J	19.5 J	9.4 U	2.1 U	30.4 U	9.5 U	2.1 U
Zinc	8.5 U	5.4 R	84.3 R	8.4 U	5.8 R	21.1 R	11.1 J	2.6 R
Cyanide		10 U	10 UJ		10 U	10 UJ		10 U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	01/16/92 MW-31	01/16/92 MW-31 Filtered	03/04/93 MW-31	01/16/92 MW-32	01/16/92 MW-32 Filtered	03/11/93 MW-32	01/08/92 MW-34	01/08/92 MW-34 Filtered
VOCs (ug/L)								
Acetone	10 U		5 U	10 U		5 U	10 U	
Semivolatiles (ug/L)								
Diethylphthalate	11 U		10 U	11 U		10 U	10 U	
Di-n-butylphthalate	11 U		10 U	11 U		10 U	10 U	
Di-n-octylphthalate	11 U		10 U	11 U		10 U	10 U	
Explosives (ug/L)								
RDX	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
2, 4, 6 - Trinitrotoluene	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
2, 6 - Dinitrotoluene	0.12 U		0.12 U	0.12 U		0.12 U	0.12 U	
Metals (ug/L)								
Aluminum	120000	97.4 U	1830	35200	97.9 U	884 J	131000	24.5 U
Antimony	53.3 U	52.9 U	54 U	54.4 J	53.2 U	54 U	55.8 U	53.2 U
Arsenic	8.3 J	3.5 U	1.7 U	5.5 J	3.5 U	1.7 U	3.5 U	3.5 U
Barium	955	21.2 J	55.7 J	347	41.6 J	53.9 J	779	10.7 R
Beryllium	6.6 R	1.2 U	0.34 J	2.8 R	1.2 U	0.3 U	7.8 R	1.1 UR
Cadmium	20 R	3 U	3.1 U	3.3 R	3 U	3.1 U	13.2	3 U
Calcium	407000	149000	130000	151000	95400	93400	538000	66900
Chromium	202	6.1 U	2.8 J	62.6	6.2 U	2.2 J	200	6.2 UR
Cobalt	78.8	19.8 U	5 U	20.5 U	19.9 U	5 U	152	20.4 U
Copper	176	14.4 U	1.9 U	43.1	14.4 U	3.7 R	233	10.2 U
Iron	176000 J	17 U	2010	52100 J	17 U	957 J	254000	7 UR
Lead	159	1.2 U	1.2 J	41.6	1.2 U	1.5 J	62.4	1.2 U
Magnesium	95500	38900	34100	41000	23500	23000	76500	7510
Manganese	2400 J	77.7	33	734 J	153	38.4	5610 J	18
Mercury	0.21 R	0.03 U	0.06 U	0.17 R	0.04 J	0.06 U	0.3 R	0.16 R
Nickel	282	15.9 U	9.3 J	83.3	15.9 U	3.5 U	362	14.7 U
Potassium	22300	2520 J	1210 J	9900	2360 J	1360 J	16200	418 J
Selenium	10 U	1.7 J	1.1 U	10 U	1 U	1.1 U	10 U	2.3 J
Silver	3.4 U	9 U	3.2 U	3.4 U	9.1 U	3.2 U	9.1 U	3.4 U
Sodium	12500	10800	17100	9100	7960	7140	4750 J	3590 J
Vanadium	180	30.3 U	4.3 J	54	30.5 U	3.4 J	167	9.5 U
Zinc	433	13.4 U	24.9 R	135	13.4 U	10.2 R	734	12.9 J
Cyanide	10 UJ		10 U	10 UJ		10 U	10 UJ	

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	03/12/93 MW-34	01/08/92 MW-35	01/08/92 MW-35 Filtered	03/12/93 MW-35	03/12/93 MW-35D	03/11/93 MW-36	03/12/93 MW-38	03/04/93 MW-39
VOCs (ug/L)								
Acetone	5 U	10 U		5 U	5 U	5 U	5 U	5 U
Semivolatiles (ug/L)								
Diethylphthalate	10 U	11 U		10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	2 J	11 U		0.7 J	2 J	10 U	10 U	10 U
Di-n-octylphthalate	10 U	11 U		10 U	10 U	10 U	10 U	10 U
Explosives (ug/L)								
RDX	0.12 U	0.12 U		0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
2, 4, 6 - Trinitrotoluene	0.12 U	0.12 U		0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
2, 6 - Dinitrotoluene	0.12 U	0.12 U		0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Metals (ug/L)								
Aluminum	13000 J	7550 J	24.5 U	600 J	1100 J	103 J	246 J	473
Antimony	53.9 U	55.5 U	53.1 U	53.9 U	54.1 U	53.7 U	53.8 U	53.8 U
Arsenic	3.3 J	3.5 U	3.5 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
Barium	103 J	103 J	37.5 R	80.2 J	86.7 J	64.3 J	33.5 J	58.1 J
Beryllium	0.89 J	1.8 R	1.1 UR	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Cadmium	3.1 U	2.9 U	3 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Calcium	117000	94700	87800	88700	93200	84700	91100	113000
Chromium	21.5	15.3 R	6.2 UR	2 U	2.2 J	2 U	2 U	2 U
Cobalt	11.1 J	19.9 J	20.4 U	5 U	5 U	5 U	5 U	5 U
Copper	21.1 J	14.4 U	10.1 U	1.9 U	2.7 R	1.9 U	2.2 R	2.4 R
Iron	19700 J	10500	7 UR	501 J	1130 J	155 J	221 J	746
Lead	7.2	3.3	1.2 U	0.91 J	1.1 J	0.89 U	0.9 U	0.9 U
Magnesium	15100	14600	12900	14200	15000	11500	11600	33800
Manganese	403	557 J	306	46.6	49.4	166	171	122
Mercury	0.08 R	0.18 R	0.18 R	0.07 R	0.1 R	0.06 U	0.09 R	0.06 U
Nickel	30.1 J	15.9 U	14.7 U	3.5 U	3.5 U	3.5 U	3.5 U	4.6 J
Potassium	3220 J	4180 J	2790 J	1290 J	1240 J	2240 J	2930 J	4800 J
Selenium	1.1 U	1.1 J	1.2 J	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Silver	3.2 U	9 U	3.4 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U
Sodium	3560 J	44100	39600	7390	7880	6600	9870	33900
Vanadium	20.1 J	30.3 U	9.5 U	2.1 U	2.6 J	2.1 U	2.1 J	2.1 U
Zinc	76	58.2	13.8 J	84.2	86.3	4.3 R	4.4 R	6.8 R
Cyanide	10 U	10 UJ		10 U	10 U	10 U	10 U	10 U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.5

	03/09/93 MW-40	03/10/93 MW-40	03/08/93 MW-40	03/10/93 MW-40	03/04/93 MW-40	03/03/93 MW-41
VOCs (ug/L)						
Acetone					5 U	5 U
Semivolatiles (ug/L)						
Diethylphthalate	10 U					
Di-n-butylphthalate	10 U					
Di-n-octylphthalate	10 U					
Explosives (ug/L)						
RDX		0.12 U				
2, 4, 6 - Trinitrotoluene		0.12 U				
2, 6 - Dinitrotoluene		0.12 U				
Metals (ug/L)						
Aluminum			647			
Antimony			53.6 U			
Arsenic			1.7 U			
Barium			53.3 J			
Beryllium			0.3 U			
Cadmium			3.1 U			
Calcium			129000			
Chromium			2 U			
Cobalt			5 U			
Copper			1.9 U			
Iron			653			
Lead			0.9 U			
Magnesium			16100			
Manganese			148			
Mercury			0.06 U			
Nickel			4.7 J			
Potassium			442 U			
Selenium			1.1 U			
Silver			3.2 U			
Sodium			6950			
Vanadium			2.1 U			
Zinc			4.4 R			
Cyanide				32.5		

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

Table A.1.6
Analytical Results For Surface Water Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Sample ID		SW45-1		SW45-2		SW45-3		SW45-4	
Matrix		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
Sample Depth Interval (Ft)		0-0.1		0-0.1		0-0.1		0-0.1	
Sample Date		11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type		SA		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Volatile Organic Compounds									
1,1,1-Trichloroethane	µG/L	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	µG/L	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	µG/L	10	U	10	U	10	U	10	U
1,1-Dichloroethane	µG/L	10	U	10	U	10	U	10	U
1,1-Dichloroethene	µG/L	10	U	10	U	10	U	10	U
1,2-Dichloroethane	µG/L	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	µG/L	10	U	10	U	10	U	10	U
1,2-Dichloropropane	µG/L	10	U	10	U	10	U	10	U
Acetone	µG/L	10	U	10	U	10	U	10	U
Benzene	µG/L	10	U	10	U	10	U	10	U
Bromodichloromethane	µG/L	10	U	10	U	10	U	10	U
Bromoform	µG/L	10	U	10	U	10	U	10	U
Carbon disulfide	µG/L	10	U	10	U	10	U	10	U
Carbon tetrachloride	µG/L	10	U	10	U	10	U	10	U
Chlorobenzene	µG/L	10	U	10	U	10	U	10	U
Chlorodibromomethane	µG/L	10	U	10	U	10	U	10	U
Chloroethane	µG/L	10	U	10	U	10	U	10	U
Chloroform	µG/L	10	U	10	U	10	U	10	U
Cis-1,3-Dichloropropene	µG/L	10	U	10	U	10	U	10	U
Ethyl benzene	µG/L	10	U	10	U	10	U	10	U
Methyl bromide	µG/L	10	U	10	U	10	U	10	U
Methyl butyl ketone	µG/L	10	U	10	U	10	U	10	U
Methyl chloride	µG/L	10	U	10	U	10	U	10	U
Methyl ethyl ketone	µG/L	10	U	10	U	10	U	10	U
Methyl isobutyl ketone	µG/L	10	U	10	U	10	U	10	U
Methylene chloride	µG/L	10	U	10	U	10	U	10	U
Styrene	µG/L	10	U	10	U	10	U	10	U
Tetrachloroethene	µG/L	10	U	10	U	10	U	10	U
Toluene	µG/L	10	U	10	U	10	U	10	U
Total Xylenes	µG/L	10	U	10	U	10	U	10	U
Trans-1,3-Dichloropropene	µG/L	10	U	10	U	10	U	10	U
Trichloroethene	µG/L	10	U	10	U	10	U	10	U
Vinyl chloride	µG/L	10	U	10	U	10	U	10	U
Semivolatile Organic Compounds									
1,2,4-Trichlorobenzene	µG/L	10	U	11	U	11	U	10	U
1,2-Dichlorobenzene	µG/L	10	U	11	U	11	U	10	U
1,3-Dichlorobenzene	µG/L	10	U	11	U	11	U	10	U
1,4-Dichlorobenzene	µG/L	10	U	11	U	11	U	10	U
2,2'-oxybis(1-Chloropropane)	µG/L	10	U	11	U	11	U	10	U
2,4,5-Trichlorophenol	µG/L	26	U	27	U	26	U	25	U
2,4,6-Trichlorophenol	µG/L	10	U	11	U	11	U	10	U
2,4-Dichlorophenol	µG/L	10	U	11	U	11	U	10	U
2,4-Dimethylphenol	µG/L	10	U	11	U	11	U	10	U
2,4-Dinitrophenol	µG/L	26	U	27	U	26	U	25	U
2,4-Dinitrotoluene	µG/L	10	U	11	U	11	U	10	U
2,6-Dinitrotoluene	µG/L	10	U	11	U	11	U	10	U
2-Chloronaphthalene	µG/L	10	U	11	U	11	U	10	U
2-Chlorophenol	µG/L	10	U	11	U	11	U	10	U
2-Methylnaphthalene	µG/L	10	U	11	U	11	U	10	U
2-Methylphenol	µG/L	10	U	11	U	11	U	10	U
2-Nitroaniline	µG/L	26	U	27	U	26	U	25	U
2-Nitrophenol	µG/L	10	U	11	U	11	U	10	U
3,3'-Dichlorobenzidine	µG/L	10	U	11	U	11	U	10	U
3-Nitroaniline	µG/L	26	U	27	U	26	U	25	U
4,6-Dinitro-2-methylphenol	µG/L	26	U	27	U	26	U	25	U
4-Bromophenyl phenyl ether	µG/L	10	U	11	U	11	U	10	U
4-Chloro-3-methylphenol	µG/L	10	U	11	U	11	U	10	U
4-Chloroaniline	µG/L	10	U	11	U	11	U	10	U
4-Chlorophenyl phenyl ether	µG/L	10	U	11	U	11	U	10	U
4-Methylphenol	µG/L	10	U	11	U	11	U	10	U
4-Nitroaniline	µG/L	26	U	27	U	26	U	25	U
4-Nitrophenol	µG/L	26	U	27	U	26	U	25	U
Acenaphthene	µG/L	10	U	11	U	11	U	10	U
Acenaphthylene	µG/L	10	U	11	U	11	U	10	U
Anthracene	µG/L	10	U	11	U	11	U	10	U
Benzo(a)anthracene	µG/L	10	U	11	U	11	U	10	U

Table A.1.6
Analytical Results For Surface Water Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Sample ID		SW45-1		SW45-2		SW45-3		SW45-4	
Matrix		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
Sample Depth Interval (Ft)		0-0.1		0-0.1		0-0.1		0-0.1	
Sample Date		11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type		SA		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Benzo(a)pyrene	µG/L	10	U	11	U	11	U	10	U
Benzo(b)fluoranthene	µG/L	10	U	11	U	11	U	10	U
Benzo(ghi)perylene	µG/L	10	U	11	U	11	U	10	U
Benzo(k)fluoranthene	µG/L	10	U	11	U	11	U	10	U
Bis(2-Chloroethoxy)methane	µG/L	10	U	11	U	11	U	10	U
Bis(2-Chloroethyl)ether	µG/L	10	U	11	U	11	U	10	U
Bis(2-Ethylhexyl)phthalate	µG/L	10	U	11	U	11	U	10	U
Butylbenzylphthalate	µG/L	10	U	11	U	11	U	10	U
Carbazole	µG/L	10	U	11	U	11	U	10	U
Chrysene	µG/L	10	U	11	U	11	U	10	U
Dibenz(a,h)anthracene	µG/L	10	U	11	U	11	U	10	U
Dibenzofuran	µG/L	10	U	11	U	11	U	10	U
Diethyl phthalate	µG/L	10	U	11	U	11	U	10	U
Dimethylphthalate	µG/L	10	U	11	U	11	U	10	U
Di-n-butylphthalate	µG/L	10	U	11	U	11	U	10	U
Di-n-octylphthalate	µG/L	10	U	11	U	11	U	10	U
Fluoranthene	µG/L	10	U	11	U	11	U	10	U
Fluorene	µG/L	10	U	11	U	11	U	10	U
Hexachlorobenzene	µG/L	10	U	11	U	11	U	10	U
Hexachlorobutadiene	µG/L	10	U	11	U	11	U	10	U
Hexachlorocyclopentadiene	µG/L	10	U	11	U	11	U	10	U
Hexachloroethane	µG/L	10	U	11	U	11	U	10	U

Table A.1.6
Analytical Results For Surface Water Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Sample ID		SW45-1		SW45-2		SW45-3		SW45-4	
Matrix		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
Sample Depth Interval (Ft)		0-0.1		0-0.1		0-0.1		0-0.1	
Sample Date		11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type		SA		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Indeno(1,2,3-cd)pyrene	µG/L	10	U	11	U	11	U	10	U
Isophorone	µG/L	10	U	11	U	11	U	10	U
Naphthalene	µG/L	10	U	11	U	11	U	10	U
Nitrobenzene	µG/L	10	U	11	U	11	U	10	U
N-Nitroso-di-n-propylamine	µG/L	10	U	11	U	11	U	10	U
N-Nitrosodiphenylamine	µG/L	10	U	11	U	11	U	10	U
Pentachlorophenol	µG/L	26	U	27	U	26	U	25	U
Phenanthrene	µG/L	10	U	11	U	11	U	10	U
Phenol	µG/L	10	U	11	U	11	U	10	U
Pyrene	µG/L	10	U	11	U	11	U	10	U
Herbicides									
2,4,5-T	µG/L	0.12	U	0.12	U	0.11	U	0.11	U
2,4,5-TP/Silvex	µG/L	0.12	U	0.12	U	0.11	U	0.11	U
2,4-D	µG/L	1.2	U	1.2	U	1.1	U	1.1	U
2,4-DB	µG/L	1.2	U	1.2	U	1.1	U	1.1	U
Dalapon	µG/L	2.6	U	2.6	U	2.5	U	2.4	U
Dicamba	µG/L	0.12	U	0.12	U	0.11	U	0.11	U
Dichloroprop	µG/L	1.2	U	1.2	U	1.1	U	1.1	U
Dinoseb	µG/L	0.56	U	0.56	U	0.54	U	0.52	U
MCPA	µG/L	120	U	120	U	110	U	110	U
MCPP	µG/L	120	U	120	U	110	U	110	U
Explosives									
1,3,5-Trinitrobenzene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
1,3-Dinitrobenzene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
2,4,6-Trinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
2,4-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
2,6-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
2-amino-4,6-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
4-amino-2,6-Dinitrotoluene	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
HMX	µG/L	0.13	U	0.45		0.49		0.13	U
RDX	µG/L	0.24	J	2		0.13	U	0.13	U
Tetryl	µG/L	0.13	U	0.13	U	0.13	U	0.13	U
Pesticides/PCBs									
4,4'-DDD	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
4,4'-DDE	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
4,4'-DDT	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Aldrin	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Alpha-BHC	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Alpha-Chlordane	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Aroclor-1016	µG/L	1	U	1	U	1.2	U	1.2	U
Aroclor-1221	µG/L	2.1	U	2.1	U	2.3	U	2.3	U
Aroclor-1232	µG/L	1	U	1	U	1.2	U	1.2	U
Aroclor-1242	µG/L	1	U	1	U	1.2	U	1.2	U
Aroclor-1248	µG/L	1	U	1	U	1.2	U	1.2	U
Aroclor-1254	µG/L	1	U	1	U	1.2	U	1.2	U
Aroclor-1260	µG/L	1	U	1	U	1.2	U	1.2	U
Beta-BHC	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Delta-BHC	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Dieldrin	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Endosulfan I	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Endosulfan II	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Endosulfan sulfate	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Endrin	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Endrin aldehyde	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Endrin ketone	µG/L	0.1	U	0.1	U	0.12	U	0.12	U
Gamma-BHC/Lindane	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Gamma-Chlordane	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Heptachlor	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Heptachlor epoxide	µG/L	0.052	U	0.052	U	0.058	U	0.058	U
Methoxychlor	µG/L	0.52	U	0.52	U	0.58	U	0.58	U
Toxaphene	µG/L	5.2	U	5.2	U	5.8	U	5.8	U
Inorganics									
Aluminum	µG/L	29,000		4,370		968		37,500	
Antimony	µG/L	52.6	U	52.4	U	52.8	U	52.5	U
Arsenic	µG/L	1.2	U	1.2	U	1.2	U	2.3	J

Table A.1.6
Analytical Results For Surface Water Samples
Feasibility Study - OD Grounds
Seneca Army Depot

Area		SEAD-45		SEAD-45		SEAD-45		SEAD-45	
Loc ID		SW/SD45-1		SW/SD45-2		SW/SD45-3		SW/SD45-4	
Sample ID		SW45-1		SW45-2		SW45-3		SW45-4	
Matrix		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
Sample Depth Interval (Ft)		0-0.1		0-0.1		0-0.1		0-0.1	
Sample Date		11/1/1993		11/1/1993		11/1/1993		11/1/1993	
QC Type		SA		SA		SA		SA	
Study ID		ESI		ESI		ESI		ESI	
Parameter	Unit	Value	Qual	Value	Qual	Value	Qual	Value	Qual
Barium	µG/L	204		82.5	J	33.5	J	439	
Beryllium	µG/L	1.3	J	0.3	U	0.3	U	1.5	J
Cadmium	µG/L	3.3	U	3.3	U	3.3	U	11.2	
Calcium	µG/L	194,000		38,500		33,800		105,000	
Chromium	µG/L	45.4		3.4	J	2.5	U	50.8	
Cobalt	µG/L	15.2	J	4.9	U	4.9	U	18.2	J
Copper	µG/L	203		119		24.8	J	612	
Cyanide	µG/L	8.3	U	8.3	U	8.3	U	47.7	
Iron	µG/L	47,700	J	5,920	J	1,270	J	60,400	J
Lead	µG/L	27.2		10.9		1.9	J	68.7	
Magnesium	µG/L	24,300		4,680	J	3,280	J	19,300	
Manganese	µG/L	841		56.7		21.1		1,250	
Mercury	µG/L	0.32		0.5		0.18	J	3	
Nickel	µG/L	72.7		8.1	J	4.2	J	74.2	
Potassium	µG/L	6,650		5,020		1,530	J	9,670	
Selenium	µG/L	5.5	U	1.1	U	1.1	U	5.5	U
Silver	µG/L	6.7	UJ	6.6	UJ	6.7	UJ	6.7	UJ
Sodium	µG/L	2,810	J	899	J	1,080	J	4,340	J
Thallium	µG/L	1.2	U	1.2	U	1.2	U	1.2	U
Vanadium	µG/L	45.9	J	6.1	J	3.3	U	54.9	
Zinc	µG/L	226		98.9		23.3		883	

Table A.1.7

	WATER SW - 110 11/07/91 Reeder Creek		WATER SW - 120 11/07/91 Reeder Creek		WATER SW - 120 12/12/91 Reeder Creek		WATER SW - 120 11/12/91 Reeder Creek		WATER SW - 120 12/12/91 Reeder Creek		WATER SW - 130 11/07/91 Reeder Creek		WATER SW - 140 11/07/91 Reeder Creek	
VOCs (ug/L)														
Methylene Chloride	5	U	5	U	5	U					5	U	5	U
Acetone	10	U	10	U	10						10	U	10	U
Carbon Disulfide	5	U	5	U	5	U					5	U	5	U
1,2 - Dichloroethane	5	U	5	U	5	U					5	U	2	J
Trichloroethene	5	U	5	U	5	U					5	U	5	U
Semivolatiles (ug/L)														
bis (2 - Ethylhexyl) phthalate	10	U	11	U	10	U					10	U	10	U
Explosives (ug/L)														
RDX	0.12	U	0.67		0.12	U					0.12	U	0.12	U
Tetryl	0.12	U	0.12	U	0.4	U					0.12	U	0.12	U
Metals (ug/L)														
Aluminum	109	U	300		102	J					109	U	109	U
Arsenic	2.8	U	2.8	U	2.9	UJ					2.8	U	2.8	U
Barium	66.6	J	65.7	J	48.9	J					52.3	J	51.2	J
Beryllium	3.5	U	3.5	U	1.4	J					3.5	U	3.5	U
Calcium	121000		114000		96000	J					100000		87100	
Chromium	9.6	U	9.5	U	6.1	UJ					9.5	U	9.6	U
Copper	19.7	U	19.6	U	14.4	UJ					19.6	U	19.7	U
Iron	98.4	J	670		142	J					236		314	
Lead	0.7	U	2.2	J	1.2	UJ					0.7	U	0.7	U
Magnesium	18700		17300		13700	J					14400		12800	
Manganese	14.6	J	121		43.7	J					34.5		68.4	
Mercury	0.08	U	0.08	U	0.08	UJ					0.08	U	0.08	U
Nickel	35.2	U	34.9	U	15.8	UJ					35	U	35.2	U
Potassium	3800	J	3800	J	949	J					3070	J	3000	J
Selenium	1.7	U	1.7	U	1	UJ					1.7	U	1.7	U
Sodium	26500		24700		21900	J					24100		23100	
Vanadium	30.9	U	30.7	U	30.3	UJ					30.7	U	30.9	U
Zinc	13.6	U	15.1	R	14.1	R					13.5	U	13.6	U
Cyanide	10	U	10	U	10	UJ					10	U	10	U
NOTES:	a) U = Compound was not detected.													
	b) J = The reported value is an estimated concentration.													
	c) R = The data was rejected in the data validation process.													

Table A.1.7

	WATER SW - 150 11/08/91 Reeder Creek		WATER SW - 150 11/08/91 Reeder Creek		WATER SW - 150 11/15/91 Reeder Creek		(Upstream) WATER SW - 196 11/12/91 Reeder Creek		WATER SW - 300 12/08/92 Reeder Creek		WATER SW - 310 12/08/92 Reeder Creek		WATER SW - 320 12/08/92 Reeder Creek	
VOCs (ug/L)														
Methylene Chloride	5	U	5	U			5	U	8	J	10	U	10	U
Acetone	10	U	10	U			10	U	10	U	10	U	10	U
Carbon Disulfide	5	U	5	U			5	U	10	U	10	U	10	U
1,2 - Dichloroethane	5	U	5	U			5	U	10	U	10	U	10	U
Trichloroethene	5	U	5	U			5	U	10	U	10	U	10	U
Semivolatiles (ug/L)														
bis (2 - Ethylhexyl) phthalate	10	U	10	U	10	U	10	U	21	U	10	U	14	U
Explosives (ug/L)														
RDX	0.12	U	0.12	U	0.12	U	0.12	U	0.21	U	0.15	U	0.14	U
Tetryl	0.12	U	0.12	U	0.4	U	0.4	U	0.12	U	0.12	U	0.12	U
Metals (ug/L)														
Aluminum	109	U	139	J			97.5	UJ	126	R	62.6	U	130	R
Arsenic	2.8	U	2.8	U			3.7	UJ	1.2	U	1.2	U	1.2	U
Barium	59.5	J	53.2	J			52.2	UJ	51.7	J	47.2	J	51.3	J
Beryllium	3.5	U	3.5	U			1.2	UJ	0.3	U	0.3	U	0.3	U
Calcium	85600		83800				65800	J	93800		93100		97800	
Chromium	9.6	U	9.5	U			6.1	UJ	2	U	2	U	2	U
Copper	19.7	U	19.6	U			14.4	UJ	1.9	U	1.9	U	1.9	U
Iron	737		737				75.3	J	276	R	170	R	326	R
Lead	1	J	1.2	J			0.7	UJ	0.9	U	0.9	U	0.89	U
Magnesium	12900		12700				8980	J	15500		15500		16400	
Manganese	236		230				16.8	R	47		32		53	
Mercury	0.11	J	0.08	U			0.08	UJ	0.06	U	0.06	U	0.06	U
Nickel	35.2	U	35	U			15.9	UJ	3.5	U	3.5	U	3.5	U
Potassium	3470	J	2800	J			2420	J	1890	R	1780	R	1300	R
Selenium	1.7	U	1.7	U			1.7	UJ	1.2	J	1.6	J	1.4	J
Sodium	22900	U	22500				59100	J	11900		10300		10600	
Vanadium	30.9	U	30.7	U			39.2	J	2.1	U	2.1	U	2.1	U
Zinc	13.6	U	13.5	U			13.4	J	3	R	3	R	5.3	R
Cyanide	10	U	10	U			10	J	14.9		10	U	10	U

NOTES: a) U = Compound was not detected.
b) J = The reported value is an estimated concentration.
c) R = The data was rejected in the data validation process.

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12	
LOC_ID		SW12-48		SW12-49		SW12-50		SW12-51		SW12-51		SW12-52		SW12-53		SW12-54		SW12-55	
MATRIX		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
SAMP_ID		12062		12061		12060		12059		12210		12069		12070		12071		12068	
SAMP_DEPTH_TOP		0		0		0		0		0		0		0		0		0	
SAMP_DEPTH_BOT		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
SAMP_DATE		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		10-Dec-97		10-Dec-97		10-Dec-97		9-Dec-97	
QC_CODE		SA		SA		SA		SA		DU		SA		SA		SA		SA	
STUDY_ID		RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1
PARAMETER	UNIT																		
VOLATILE ORGANICS																			
1,1,1-Trichloroethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,1,2,2-Tetrachloroethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,1,2-Trichloroethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,1-Dichloroethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,1-Dichloroethene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dibromo-3-chloropropane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dibromoethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dichlorobenzene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dichloroethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,2-Dichloropropane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,3-Dichlorobenzene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,4-Dichlorobenzene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Acetone	UG/L			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Benzene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Bromochloromethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Bromodichloromethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Bromoform	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Carbon disulfide	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Carbon tetrachloride	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Chlorobenzene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Chlorodibromomethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Chloroethane	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Chloroform	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Cis-1,2-Dichloroethene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Cis-1,3-Dichloropropene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Ethyl benzene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Methyl bromide	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Methyl butyl ketone	UG/L			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Methyl chloride	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Methyl ethyl ketone	UG/L			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Methyl isobutyl ketone	UG/L			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Methylene chloride	UG/L			2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Styrene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Tetrachloroethene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Toluene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Total Xylenes	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Trans-1,2-Dichloroethene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Trans-1,3-Dichloropropene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Trichloroethene	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12	
LOC_ID		SW12-48		SW12-49		SW12-50		SW12-51		SW12-51		SW12-52		SW12-53		SW12-54		SW12-55	
MATRIX		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
SAMP_ID		12062		12061		12060		12059		12210		12069		12070		12071		12068	
SAMP_DEPTH_TOP		0		0		0		0		0		0		0		0		0	
SAMP_DEPTH_BOT		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
SAMP_DATE		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		10-Dec-97		10-Dec-97		10-Dec-97		9-Dec-97	
QC_CODE		SA		SA		SA		SA		DU		SA		SA		SA		SA	
STUDY_ID		RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1
PARAMETER	UNIT																		
Vinyl chloride	UG/L			1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
SEMI VOLATILE ORGANICS																			
1,2,4-Trichlorobenzene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
1,2-Dichlorobenzene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
1,3-Dichlorobenzene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
1,4-Dichlorobenzene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2,4,5-Trichlorophenol	UG/L	2.6	UJ	2.7	U	2.6	U	2.6	U	2.5	U	2.6	U	2.7	U	2.7	U	2.6	U
2,4,6-Trichlorophenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2,4-Dichlorophenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2,4-Dimethylphenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2,4-Dinitrophenol	UG/L	2.6	UJ	2.7	U	2.6	U	2.6	U	2.5	U	2.6	U	2.7	U	2.7	U	2.6	U
2,4-Dinitrotoluene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2,6-Dinitrotoluene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2-Chloronaphthalene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2-Chlorophenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2-Methylnaphthalene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2-Methylphenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
2-Nitroaniline	UG/L	2.6	UJ	2.7	U	2.6	U	2.6	U	2.5	U	2.6	U	2.7	U	2.7	U	2.6	U
2-Nitrophenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
3,3'-Dichlorobenzidine	UG/L	1	UJ	1.1	UJ	1	UJ	1.1	UJ	1	U	1	U	1.1	U	1.1	U	1	U
3-Nitroaniline	UG/L	2.6	UJ	2.7	UJ	2.6	UJ	2.6	UJ	2.5	U	2.6	UJ	2.7	UJ	2.7	UJ	2.6	UJ
4,6-Dinitro-2-methylphenol	UG/L	2.6	UJ	2.7	U	2.6	U	2.6	U	2.5	U	2.6	U	2.7	U	2.7	U	2.6	U
4-Bromophenyl phenyl ether	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
4-Chloro-3-methylphenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
4-Chloroaniline	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	UJ	1.1	UJ	1.1	UJ	1	UJ
4-Chlorophenyl phenyl ether	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
4-Methylphenol	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
4-Nitroaniline	UG/L	2.6	UJ	2.7	UJ	2.6	UJ	2.6	UJ	2.5	U	2.6	UJ	2.7	UJ	2.7	UJ	2.6	UJ
4-Nitrophenol	UG/L	2.6	UJ	2.7	U	2.6	U	2.6	U	2.5	U	2.6	U	2.7	U	2.7	U	2.6	U
Acenaphthene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Acenaphthylene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Anthracene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Benzo(a)anthracene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Benzo(a)pyrene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Benzo(b)fluoranthene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Benzo(ghi)perylene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Benzo(k)fluoranthene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Bis(2-Chloroethoxy)methane	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Bis(2-Chloroethyl)ether	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12	
LOC_ID		SW12-48		SW12-49		SW12-50		SW12-51		SW12-51		SW12-52		SW12-53		SW12-54		SW12-55	
MATRIX		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
SAMP_ID		12062		12061		12060		12059		12210		12069		12070		12071		12068	
SAMP_DEPTH_TOP		0		0		0		0		0		0		0		0		0	
SAMP_DEPTH_BOT		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
SAMP_DATE		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		10-Dec-97		10-Dec-97		10-Dec-97		9-Dec-97	
QC_CODE		SA		SA		SA		SA		DU		SA		SA		SA		SA	
STUDY_ID		RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1
PARAMETER	UNIT																		
Bis(2-Chloroisopropyl)ether	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Bis(2-Ethylhexyl)phthalate	UG/L	0.14	J	1.1	U	1	U	1.1	U	0.26	J	1	U	1.1	U	1.1	UJ	1	U
Butylbenzylphthalate	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	0.11	J	1.1	U	1.1	U	1	U
Carbazole	UG/L	1	UJ	1.1	UJ	1	UJ	1.1	UJ	1	U	1	UJ	1.1	UJ	1.1	UJ	1	UJ
Chrysene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Di-n-butylphthalate	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	UJ	1	U
Di-n-octylphthalate	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Dibenz(a,h)anthracene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Dibenzofuran	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Diethyl phthalate	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	0.072	J	0.06	J
Dimethylphthalate	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Fluoranthene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Fluorene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Hexachlorobenzene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Hexachlorobutadiene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	UJ	1.1	UJ	1.1	U	1	UJ
Hexachlorocyclopentadiene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	UJ	1.1	UJ	1.1	UJ	1	UJ
Hexachloroethane	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	UJ	1	U
Indeno(1,2,3-cd)pyrene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Isophorone	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
N-Nitrosodiphenylamine	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
N-Nitrosodipropylamine	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Naphthalene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Nitrobenzene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Pentachlorophenol	UG/L	2.6	UJ	2.7	U	2.6	U	2.6	U	2.5	U	2.6	U	2.7	U	2.7	U	2.6	U
Phenanthrene	UG/L	1	UJ	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Phenol	UG/L	1	U	1.1	U	1	U	1.1	U	1	U	1	U	1.1	U	1.1	U	1	U
Pyrene	UG/L	1	U	1.1	U	1	U	1.1	U	1	U	0.005	U	0.011	U	0.005	U	0.005	U
PESTICIDES/PCBS																			
4,4'-DDD	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
4,4'-DDE	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
4,4'-DDT	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Aldrin	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Alpha-BHC	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Alpha-Chlordane	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Aroclor-1016	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U
Aroclor-1221	UG/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.21	U	0.2	U	0.21	U
Aroclor-1232	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U
Aroclor-1242	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U
Aroclor-1248	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12	
LOC_ID		SW12-48		SW12-49		SW12-50		SW12-51		SW12-51		SW12-52		SW12-53		SW12-54		SW12-55	
MATRIX		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
SAMP_ID		12062		12061		12060		12059		12210		12069		12070		12071		12068	
SAMP_DEPTH_TOP		0		0		0		0		0		0		0		0		0	
SAMP_DEPTH_BOT		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
SAMP_DATE		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		10-Dec-97		10-Dec-97		10-Dec-97		9-Dec-97	
QC_CODE		SA		SA		SA		SA		DU		SA		SA		SA		SA	
STUDY_ID		RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1	RI Phase 1	Step 1
PARAMETER	UNIT																		
Aroclor-1254	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U
Aroclor-1260	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U
Beta-BHC	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Delta-BHC	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Dieldrin	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Endosulfan I	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Endosulfan II	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Endosulfan sulfate	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Endrin	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Endrin aldehyde	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Endrin ketone	UG/L	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Gamma-BHC/Lindane	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Gamma-Chlordane	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Heptachlor	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Heptachlor epoxide	UG/L	0.005	U	0.0051	U	0.0051	U	0.005	U	0.005	U	0.0051	U	0.0053	U	0.0051	U	0.0052	U
Hexachlorobenzene	UG/L	**0.013**		0.01	U	0.01	U	0.01	U	0.01	U	0.01	U	0.011	U	0.01	U	0.01	U
Methoxychlor	UG/L	0.05	U	0.051	U	0.051	U	0.05	U	0.05	U	0.051	U	0.053	U	0.051	U	0.052	U
Toxaphene	UG/L	0.5	U	0.51	U	0.51	U	0.5	U	0.5	U	0.51	U	0.53	U	0.51	U	0.52	U
METALS																			
Aluminum	UG/L	12.3	U	79.9		28.5		54.1		74.5		49.6	J	12.3	U	12.3	U	12.3	U
Antimony	UG/L	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U
Arsenic	UG/L	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U
Barium	UG/L	43		42.9		40.4		42.5		42.2		53.2	J	50.5	J	50.6	J	50.8	J
Beryllium	UG/L	0.1		0.21		0.18		0.11		0.1	U	0.1	U	0.1	U	0.16	J	0.1	U
Cadmium	UG/L	0.3	U	1.2		0.78		0.45		0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Calcium	UG/L	88300		84100		82500		85600		83800		98400		97100		92700		93800	
Chromium	UG/L	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U	1.1	U
Cobalt	UG/L	1.7	U	1.7	U	1.7	U	1.7	U	1.7	U	1.7	U	1.7	U	1.7	U	1.7	U
Copper	UG/L	2.6		2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U	2.3	U
Cyanide	UG/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Iron	UG/L	25.6	U	140		56.1		97.1		113		79	J	26.3	J	36.8	J	36.6	J
Lead	UG/L	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U
Magnesium	UG/L	11800		12600		12400		12800		12600		15100		14600		13800		14600	
Manganese	UG/L	1		4.2		2		12		11.8		9.5	J	7.3	J	8.2	J	5.4	J
Mercury	UG/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	UG/L	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.3	U	2.3	U	2.3	U	2.3	U
Potassium	UG/L	2930		2870		2650		2720		2790		1810	J	1660	J	1630	J	1970	J
Selenium	UG/L	4.7	U	4.7	U	4.7	U	4.7	U	4.7	U	4.7	U	4.7	U	4.7	U	4.7	U
Silver	UG/L	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
Sodium	UG/L	32400		28600		28000		29200		28900		18300		15900		12700		18000	

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12		SEAD-12	
LOC_ID		SW12-48		SW12-49		SW12-50		SW12-51		SW12-51		SW12-52		SW12-53		SW12-54		SW12-55	
MATRIX		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
SAMP_ID		12062		12061		12060		12059		12210		12069		12070		12071		12068	
SAMP_DEPTH_TOP		0		0		0		0		0		0		0		0		0	
SAMP_DEPTH_BOT		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
SAMP_DATE		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		11-Nov-97		10-Dec-97		10-Dec-97		10-Dec-97		9-Dec-97	
QC_CODE		SA		SA		SA		SA		DU		SA		SA		SA		SA	
STUDY_ID		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1		RI Phase 1 Step 1	
PARAMETER	UNIT																		
Thallium	UG/L	6.3	U	6.3	U	6.3	U	6.3	U	6.3	U	6.3	U	6.3	U	6.3	U	6.3	U
Vanadium	UG/L	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U
Zinc	UG/L	13.1		10.8		12.5		10		9.6		6.2	J	3.1	U	3.8	J	4	J
ADDITIONAL ANALYSES																			
Ammonia-Nitrogen	MG/L	0.02		0.02		0.02		0.02		0.01		0.02		0.02		0.02		0.03	
Nitrate/Nitrite	%W/W	0.06		0.01		0.01		0.02											
Nitrate/Nitrite	MG/KG											0.13		0.01		0.01		0.27	
Total Dissolved Solids	MG/L	424		379		383		372				365		348		332		362	
TOC--Soil 9060	MG/KG											3.6		3.6		3.5		3.5	
Total Suspended Solids	MG/L	0.6		32.6		1.2		1.5				1.4		0.9		0.5		0.5	
Phosphate, Total as P	MG/L	0.02		0.01		0.01		0.01				0.02		0.02		0.02		0.02	
Alkalinity	MG/L	224		200		200		208				235		230		230		228	
Total Hardness as CaCO3	MG/L	297		263		260		263				290		285		290		285	
TOC--Water 415.1	MG/L																		
pH		7.6		7.85		8.4		8.33		8.33		7.78		7.65		7.77		8.18	

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		RI Phase 1	
LOC_ID		SW12-56		SW12-57		67669	
MATRIX		SURFACE WATER		SURFACE WATER		SW12-58	
SAMP_ID		12067		12066		12065	
SAMP_DEPTH_TOP		0		0		SA	
SAMP_DEPTH_BOT		N/A		N/A		0	
SAMP_DATE		9-Dec-97		9-Dec-97		0.1	
QC_CODE		SA		SA		SURFACE	
STUDY_ID		RI Phase 1 Step 1		RI Phase 1 Step 1		9-Dec-97	
PARAMETER	UNIT						
VOLATILE ORGANICS							
1,1,1-Trichloroethane	UG/L	1	U	1	U	1	U
1,1,2,2-Tetrachloroethane	UG/L	1	U	1	U	1	U
1,1,2-Trichloroethane	UG/L	1	U	1	U	1	U
1,1-Dichloroethane	UG/L	1	U	1	U	1	U
1,1-Dichloroethene	UG/L	1	U	1	U	1	U
1,2-Dibromo-3-chloropropane	UG/L	1	U	1	U	1	U
1,2-Dibromoethane	UG/L	1	U	1	U	1	U
1,2-Dichlorobenzene	UG/L	1	U	1	U	1	U
1,2-Dichloroethane	UG/L	1	U	1	U	1	U
1,2-Dichloropropane	UG/L	1	U	1	U	1	U
1,3-Dichlorobenzene	UG/L	1	U	1	U	1	U
1,4-Dichlorobenzene	UG/L	1	U	1	U	1	U
Acetone	UG/L	5	U	5	U	5	U
Benzene	UG/L	1	U	1	U	1	U
Bromochloromethane	UG/L	1	U	1	U	1	U
Bromodichloromethane	UG/L	1	U	1	U	1	U
Bromoform	UG/L	1	U	1	U	1	U
Carbon disulfide	UG/L	1	U	1	U	1	U
Carbon tetrachloride	UG/L	1	U	1	U	1	U
Chlorobenzene	UG/L	1	U	1	U	1	U
Chlorodibromomethane	UG/L	1	U	1	U	1	U
Chloroethane	UG/L	1	U	1	U	1	U
Chloroform	UG/L	1	U	1	U	1	U
Cis-1,2-Dichloroethene	UG/L	1	U	1	U	1	U
Cis-1,3-Dichloropropene	UG/L	1	U	1	U	1	U
Ethyl benzene	UG/L	1	U	1	U	1	U
Methyl bromide	UG/L	1	U	1	U	1	U
Methyl butyl ketone	UG/L	5	U	5	U	5	U
Methyl chloride	UG/L	1	U	1	U	1	U
Methyl ethyl ketone	UG/L	5	U	5	U	5	U
Methyl isobutyl ketone	UG/L	5	U	5	U	5	U
Methylene chloride	UG/L	2	U	2	U	2	U
Styrene	UG/L	1	U	1	U	1	U
Tetrachloroethene	UG/L	1	U	1	U	1	U
Toluene	UG/L	1	U	1	U	1	U
Total Xylenes	UG/L	1	U	1	U	1	U
Trans-1,2-Dichloroethene	UG/L	1	U	1	U	1	U
Trans-1,3-Dichloropropene	UG/L	1	U	1	U	1	U
Trichloroethene	UG/L	1	U	1	U	1	U

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		RI Phase 1	
LOC_ID		SW12-56		SW12-57		67669	
MATRIX		SURFACE WATER		SURFACE WATER		SW12-58	
SAMP_ID		12067		12066		12065	
SAMP_DEPTH_TOP		0		0		SA	
SAMP_DEPTH_BOT		N/A		N/A		0	
SAMP_DATE		9-Dec-97		9-Dec-97		0.1	
QC_CODE		SA		SA		SURFACE	
STUDY_ID		RI Phase 1	Step 1	RI Phase 1	Step 1	9-Dec-97	
PARAMETER	UNIT						
Vinyl chloride	UG/L	1	U	1	U	1	U
SEMI VOLATILE ORGANICS							
1,2,4-Trichlorobenzene	UG/L	1	U	1	U	1.1	U
1,2-Dichlorobenzene	UG/L	1	U	1	U	1.1	U
1,3-Dichlorobenzene	UG/L	1	U	1	U	1.1	U
1,4-Dichlorobenzene	UG/L	1	U	1	U	1.1	U
2,4,5-Trichlorophenol	UG/L	2.6	U	2.6	U	2.7	U
2,4,6-Trichlorophenol	UG/L	1	U	1	U	1.1	U
2,4-Dichlorophenol	UG/L	1	U	1	U	1.1	U
2,4-Dimethylphenol	UG/L	1	U	1	U	1.1	U
2,4-Dinitrophenol	UG/L	2.6	U	2.6	U	2.7	U
2,4-Dinitrotoluene	UG/L	1	U	1	U	1.1	U
2,6-Dinitrotoluene	UG/L	1	U	1	U	1.1	U
2-Chloronaphthalene	UG/L	1	U	1	U	1.1	U
2-Chlorophenol	UG/L	1	U	1	U	1.1	U
2-Methylnaphthalene	UG/L	1	U	1	U	1.1	U
2-Methylphenol	UG/L	1	U	1	U	1.1	U
2-Nitroaniline	UG/L	2.6	U	2.6	U	2.7	U
2-Nitrophenol	UG/L	1	U	1	U	1.1	U
3,3'-Dichlorobenzidine	UG/L	1	U	1	U	1.1	U
3-Nitroaniline	UG/L	2.6	UJ	2.6	UJ	2.7	UJ
4,6-Dinitro-2-methylphenol	UG/L	2.6	U	2.6	U	2.7	U
4-Bromophenyl phenyl ether	UG/L	1	U	1	U	1.1	U
4-Chloro-3-methylphenol	UG/L	1	U	1	U	1.1	U
4-Chloroaniline	UG/L	1	UJ	1	UJ	1.1	UJ
4-Chlorophenyl phenyl ether	UG/L	1	U	1	U	1.1	U
4-Methylphenol	UG/L	1	U	1	U	1.1	U
4-Nitroaniline	UG/L	2.6	UJ	2.6	UJ	2.7	UJ
4-Nitrophenol	UG/L	2.6	U	2.6	U	2.7	U
Acenaphthene	UG/L	1	U	1	U	1.1	U
Acenaphthylene	UG/L	1	U	1	U	1.1	U
Anthracene	UG/L	1	U	1	U	1.1	U
Benzo(a)anthracene	UG/L	1	U	1	U	1.1	U
Benzo(a)pyrene	UG/L	1	U	1	U	1.1	U
Benzo(b)fluoranthene	UG/L	1	U	1	U	1.1	U
Benzo(ghi)perylene	UG/L	1	U	1	U	1.1	U
Benzo(k)fluoranthene	UG/L	1	U	1	U	1.1	U
Bis(2-Chloroethoxy)methane	UG/L	1	U	1	U	1.1	U
Bis(2-Chloroethyl)ether	UG/L	1	U	1	U	1.1	U

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		RI Phase 1	
LOC_ID		SW12-56		SW12-57		67669	
MATRIX		SURFACE WATER		SURFACE WATER		SW12-58	
SAMP_ID		12067		12066		12065	
SAMP_DEPTH_TOP		0		0		SA	
SAMP_DEPTH_BOT		N/A		N/A		0	
SAMP_DATE		9-Dec-97		9-Dec-97		0.1	
QC_CODE		SA		SA		SURFACE	
STUDY_ID		RI Phase 1	Step 1	RI Phase 1	Step 1	9-Dec-97	
PARAMETER	UNIT						
Bis(2-Chloroisopropyl)ether	UG/L	1	U	1	U	1.1	U
Bis(2-Ethylhexyl)phthalate	UG/L	1	U	1	U	1.1	U
Butylbenzylphthalate	UG/L	1	U	0.12	J	1.1	U
Carbazole	UG/L	1	UJ	1	UJ	1.1	UJ
Chrysene	UG/L	1	U	1	U	1.1	U
Di-n-butylphthalate	UG/L	1	U	1	U	1.1	U
Di-n-octylphthalate	UG/L	1	U	1	U	1.1	U
Dibenz(a,h)anthracene	UG/L	1	U	1	U	1.1	U
Dibenzofuran	UG/L	1	U	1	U	1.1	U
Diethyl phthalate	UG/L	1	U	1	U	1.1	U
Dimethylphthalate	UG/L	1	U	1	U	1.1	U
Fluoranthene	UG/L	1	U	1	U	1.1	U
Fluorene	UG/L	1	U	1	U	1.1	U
Hexachlorobenzene	UG/L	1	U	1	U	1.1	U
Hexachlorobutadiene	UG/L	1	UJ	1	UJ	1.1	UJ
Hexachlorocyclopentadiene	UG/L	1	UJ	1	UJ	1.1	UJ
Hexachloroethane	UG/L	1	U	1	U	1.1	U
Indeno(1,2,3-cd)pyrene	UG/L	1	U	1	U	1.1	U
Isophorone	UG/L	1	U	1	U	1.1	U
N-Nitrosodiphenylamine	UG/L	1	U	1	U	1.1	U
N-Nitrosodipropylamine	UG/L	1	U	1	U	1.1	U
Naphthalene	UG/L	1	U	1	U	1.1	U
Nitrobenzene	UG/L	1	U	1	U	1.1	U
Pentachlorophenol	UG/L	2.6	U	2.6	U	2.7	U
Phenanthrene	UG/L	1	U	1	U	1.1	U
Phenol	UG/L	1	U	1	U	1.1	U
Pyrene	UG/L	0.005	U	0.005	U	0.011	U
PESTICIDES/PCBS							
4,4'-DDD	UG/L	0.01	U	0.01	U	0.011	U
4,4'-DDE	UG/L	0.01	U	0.01	U	0.011	U
4,4'-DDT	UG/L	0.01	U	0.01	U	0.011	U
Aldrin	UG/L	0.0052	U	0.005	U	0.0053	U
Alpha-BHC	UG/L	0.0052	U	0.005	U	0.0053	U
Alpha-Chlordane	UG/L	0.0052	U	0.005	U	0.0053	U
Aroclor-1016	UG/L	0.1	U	0.1	U	0.11	U
Aroclor-1221	UG/L	0.21	U	0.2	U	0.21	U
Aroclor-1232	UG/L	0.1	U	0.1	U	0.11	U
Aroclor-1242	UG/L	0.1	U	0.1	U	0.11	U
Aroclor-1248	UG/L	0.1	U	0.1	U	0.11	U

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		RI Phase 1	
LOC_ID		SW12-56		SW12-57		67669	
MATRIX		SURFACE WATER		SURFACE WATER		SW12-58	
SAMP_ID		12067		12066		12065	
SAMP_DEPTH_TOP		0		0		SA	
SAMP_DEPTH_BOT		N/A		N/A		0	
SAMP_DATE		9-Dec-97		9-Dec-97		0.1	
QC_CODE		SA		SA		SURFACE	
STUDY_ID		RI Phase 1 Step 1		RI Phase 1 Step 1		9-Dec-97	
PARAMETER	UNIT						
Aroclor-1254	UG/L	0.1	U	0.1	U	0.11	U
Aroclor-1260	UG/L	0.01	U	0.1	U	0.11	U
Beta-BHC	UG/L	0.0052	U	0.005	U	0.0053	U
Delta-BHC	UG/L	0.0052	U	0.005	U	0.0053	U
Dieldrin	UG/L	0.01	U	0.01	U	0.011	U
Endosulfan I	UG/L	0.0052	U	0.005	U	0.0053	U
Endosulfan II	UG/L	0.01	U	0.01	U	0.011	U
Endosulfan sulfate	UG/L	0.01	U	0.01	U	0.011	U
Endrin	UG/L	0.01	U	0.01	U	0.011	U
Endrin aldehyde	UG/L	0.01	U	0.01	U	0.011	U
Endrin ketone	UG/L	0.01	U	0.01	U	0.011	U
Gamma-BHC/Lindane	UG/L	0.0052	U	0.005	U	0.0053	U
Gamma-Chlordane	UG/L	0.0052	U	0.005	U	0.0053	U
Heptachlor	UG/L	0.0052	U	0.005	U	0.0053	U
Heptachlor epoxide	UG/L	0.0052	U	0.005	U	0.0053	U
Hexachlorobenzene	UG/L	0.01	U	0.01	U	0.011	U
Methoxychlor	UG/L	0.052	U	0.05	U	0.053	U
Toxaphene	UG/L	0.52	U	0.5	U	0.53	U
METALS							
Aluminum	UG/L	12.3	U	12.3	U	12.3	U
Antimony	UG/L	3.5	U	3.5	U	3.5	U
Arsenic	UG/L	3.6	U	3.6	U	3.6	U
Barium	UG/L	49.6	J	49.4	J	52.2	J
Beryllium	UG/L	0.15	J	0.16	J	0.14	J
Cadmium	UG/L	0.45	J	0.44	J	0.3	U
Calcium	UG/L	93700		95700		98300	
Chromium	UG/L	1.1	U	1.1	U	1.1	U
Cobalt	UG/L	1.7	U	1.7	U	1.7	U
Copper	UG/L	2.3	U	2.3	U	2.3	U
Cyanide	UG/L	5	U	5	U	5	U
Iron	UG/L	50	J	25.6	U	25.6	U
Lead	UG/L	1.8	U	1.8	U	1.8	U
Magnesium	UG/L	14700		15200		15600	
Manganese	UG/L	8.8	J	2	J	16.9	
Mercury	UG/L	0.1	U	0.1	U	0.1	U
Nickel	UG/L	2.3	U	2.3	U	2.3	U
Potassium	UG/L	1990	J	1990	J	2020	J
Selenium	UG/L	4.7	U	4.7	U	4.7	U
Silver	UG/L	2.1	U	2.1	U	2.1	U
Sodium	UG/L	18300		18700		19200	

TABLE A.1.8
DOWNGRADIENT METALS DATA-SURFACE WATER
SEAD-12 REMEDIATION INVESTIGATION
SENECA ARMY DEPOT ACTIVITY ROMULUS, NY

FACILITY		SEAD-12		SEAD-12		RI Phase 1	
LOC_ID		SW12-56		SW12-57		67669	
MATRIX		SURFACE WATER		SURFACE WATER		SW12-58	
SAMP_ID		12067		12066		12065	
SAMP_DEPTH_TOP		0		0		SA	
SAMP_DEPTH_BOT		N/A		N/A		0	
SAMP_DATE		9-Dec-97		9-Dec-97		0.1	
QC_CODE		SA		SA		SURFACE	
STUDY_ID		RI Phase 1 Step 1		RI Phase 1 Step 1		9-Dec-97	
PARAMETER	UNIT						
Thallium	UG/L	6.3	U	6.3	U	6.3	U
Vanadium	UG/L	1.6	U	1.6	U	1.6	U
Zinc	UG/L	15.4	J	3.7	J	4.7	J
ADDITIONAL ANALYSES							
Ammonia-Nitrogen	MG/L	0.03		0.03		0.04	
Nitrate/Nitrite	%W/W						
Nitrate/Nitrite	MG/KG	0.25		0.68		0.66	
Total Dissolved Solids	MG/L	366		368		388	
TOC--Soil 9060	MG/KG	3.6		3.4		3.5	
Total Suspended Solids	MG/L	1		0.5		1.1	
Phosphate, Total as P	MG/L	0.03		0.04		0.03	
Alkalinity	MG/L	222		222		228	
Total Hardness as CaCO3	MG/L	285		285		295	
TOC--Water 415.1	MG/L						
pH		8.19		8.12		8.02	

Attachment A.2 Tables

A.2 Summary of Statistics and ProUCL Output

Table A.2.1

OD Hill Surface Soil Summary Statistics

	General Statistics on Uncensored Data
Date/Time of Computation	9/30/2014 10:19
User Selected Options	
From File	ProUCL_ODH_Surface Soil_rev2.xls
Full Precision	OFF

From File: ProUCL_ODH_Surface Soil_rev2.xls

General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
2,4-Dinitrotoluene	22	33	7	15	68.18%	0.082	0.38	0.263	0.266	0.516	1.964
Benzo(a)pyrene	22	33	4	18	81.82%	0.09	0.44	0.048	4.22E-04	0.0205	0.428
Benzo(ghi)perylene	22	33	2	20	90.91%	0.1	0.5	0.0435	2.03E-05	0.0045	0.103
N-Nitrosodipropylami	22	33	1	21	95.45%	0.08	0.53	0.082	5.60E-05	0.00748	0.0913
Phenanthrene	22	33	5	17	77.27%	0.08	0.42	0.0292	3.26E-05	0.00571	0.195
Nitroglycerine	26	20	1	25	96.15%	0.11	0.16	0.163	0.0715	0.267	1.635
Aroclor-1254	22	33	4	18	81.82%	0.0047	0.05	0.129	0.181	0.426	3.287
Aluminum	51	4	51	0	0.00%	N/A	N/A	18463	15222561	3902	0.211
Arsenic	51	4	51	0	0.00%	N/A	N/A	5.994	5.328	2.308	0.385
Cadmium	51	4	48	3	5.88%	0.86	1.1	28.69	22974	151.6	5.284
Chromium	51	4	51	0	0.00%	N/A	N/A	37.04	3439	58.64	1.583
Cobalt	51	4	51	0	0.00%	N/A	N/A	12.12	2.601	1.613	0.133
Copper	51	4	51	0	0.00%	N/A	N/A	491.5	359663	599.7	1.22
Lead	51	4	51	0	0.00%	N/A	N/A	83.57	19514	139.7	1.672
Manganese	51	4	51	0	0.00%	N/A	N/A	610.9	18207	134.9	0.221
Silver	51	4	41	10	19.61%	0.04	3	6.65	789.8	28.1	4.226
Thallium	51	4	4	47	92.16%	0.09	0.44	0.105	0.00169	0.0411	0.393
Vanadium	51	4	51	0	0.00%	N/A	N/A	29.64	26.31	5.129	0.173
Mercury	51	4	51	0	0.00%	N/A	N/A	3.2	3.007	1.734	0.542

Table A.2.1

OD Hill Surface Soil Summary Statistics, continued

General Statistics for Raw Data Sets using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
2,4-Dinitrotoluene	7	33	0.083	2.5	0.642	0.28	0.73	0.854	0.178	2.252	1.331
Benzo(a)pyrene	4	33	0.028	0.082	0.048	0.041	5.62E-04	0.0237	0.0126	1.498	0.494
Benzo(ghi)perylene	2	33	0.039	0.048	0.0435	0.0435	4.05E-05	0.00636	0.00667	N/A	0.146
N-Nitrosodipropylami	1	33	0.11	0.11	0.11	0.11	N/A	N/A	0	N/A	N/A
Phenanthrene	5	33	0.024	0.038	0.0292	0.025	4.07E-05	0.00638	0.00148	0.808	0.218
Nitroglycerine	1	20	1.5	1.5	1.5	1.5	N/A	N/A	0	N/A	N/A
Aroclor-1254	4	33	0.074	2	0.691	0.345	0.815	0.903	0.375	1.641	1.306
Aluminum	51	4	5910	35000	18463	17900	15222561	3902	1779	1.25	0.211
Arsenic	51	4	4	16.1	5.994	5.2	5.328	2.308	0.593	2.835	0.385
Cadmium	48	4	0.76	1100	30.43	7.55	24877	157.7	1.779	6.92	5.183
Chromium	51	4	10.6	446	37.04	28.5	3439	58.64	3.41	7.053	1.583
Cobalt	51	4	9	19.7	12.12	12.2	2.601	1.613	1.038	1.851	0.133
Copper	51	4	38.9	4180	491.5	411	359663	599.7	185.3	5.011	1.22
Lead	51	4	19.8	998	83.57	59.3	19514	139.7	12.6	5.989	1.672
Manganese	51	4	361	1080	610.9	599	18207	134.9	83.02	1.538	0.221
Silver	41	4	0.23	205	8.137	3.4	995.3	31.55	0.89	6.381	3.877
Thallium	4	4	0.1	0.27	0.2	0.215	0.00527	0.0726	0.0519	-1.099	0.363
Vanadium	51	4	16.6	53.7	29.64	28.7	26.31	5.129	2.669	2.017	0.173
Mercury	51	4	0.15	7	3.2	3.5	3.007	1.734	1.631	0.0728	0.542

Percentiles using all Detects (Ds) and Non-Detects (NDs)

Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
2,4-Dinitrotoluene	22	33	0.094	0.0962	0.097	0.12	0.275	0.344	0.38	0.808	2.149
Benzo(a)pyrene	22	33	0.0487	0.092	0.1	0.11	0.118	0.12	0.378	0.418	0.436
Benzo(ghi)perylene	22	33	0.101	0.112	0.12	0.12	0.303	0.36	0.416	0.439	0.487
N-Nitrosodipropylami	22	33	0.0911	0.094	0.0943	0.0985	0.375	0.388	0.438	0.497	0.524
Phenanthrene	22	33	0.0259	0.0464	0.0828	0.0945	0.0993	0.1	0.335	0.379	0.412
Nitroglycerine	26	20	0.125	0.13	0.13	0.14	0.15	0.15	0.155	0.16	1.165
Aroclor-1254	22	33	0.0054	0.00542	0.0055	0.0057	0.041	0.0484	0.106	0.557	1.702
Aluminum	51	4	15000	16700	16950	17900	19400	20200	22200	24100	31450
Arsenic	51	4	4.6	4.9	4.95	5.2	6.05	6.4	7.3	11.7	14.35
Cadmium	51	4	1.6	4.7	5.3	7.4	8.45	8.7	9.5	19.25	562.8
Chromium	51	4	24.7	25.6	26.5	28.5	30.75	31.4	35.3	39.3	247.2
Cobalt	51	4	10.6	11.2	11.2	12.2	12.7	12.9	13.4	14	17.3
Copper	51	4	142	221	252	411	490.5	536	794	956.5	2980
Lead	51	4	29.7	48.9	50.9	59.3	66.35	69.4	86.2	159	675
Manganese	51	4	470	530	540	599	654	662	710	867	1065
Silver	51	4	0.82	1.6	2.05	3	3.8	3.9	4.3	5.4	106.9
Thallium	51	4	0.11	0.15	0.17	0.2	0.28	0.29	0.34	0.37	0.41
Vanadium	51	4	24.4	27.3	27.45	28.7	31.55	31.7	32.8	38.05	46.85
Mercury	51	4	0.48	1.6	2.05	3.5	4.3	4.4	5.3	6.2	6.9

Table A.2.2

OD Hill Surface Soil UCL Calculations

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/30/2014 10:20:54 AM
From File	ProUCL ODH Surface Soil rev2.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

2,4-Dinitrotoluene

General Statistics

Total Number of Observations	22	Number of Distinct Observations	16
		Number of Missing Observations	33
Number of Detects	7	Number of Non-Detects	15
Number of Distinct Detects	7	Number of Distinct Non-Detects	10
Minimum Detect	0.083	Minimum Non-Detect	0.082
Maximum Detect	2.5	Maximum Non-Detect	0.38
Variance Detects	0.73	Percent Non-Detects	68.18%
Mean Detects	0.642	SD Detects	0.854
Median Detects	0.28	CV Detects	1.331
Skewness Detects	2.252	Kurtosis Detects	5.221
Mean of Logged Detects	-1.026	SD of Logged Detects	1.113

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.681	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.263	Standard Error of Mean	0.119
SD	0.516	95% KM (BCA) UCL	0.48
95% KM (t) UCL	0.468	95% KM (Percentile Bootstrap) UCL	0.474
95% KM (z) UCL	0.459	95% KM Bootstrap t UCL	1.078
90% KM Chebyshev UCL	0.62	95% KM Chebyshev UCL	0.781
97.5% KM Chebyshev UCL	1.006	99% KM Chebyshev UCL	1.446

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.47	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.266	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.32	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.992	k star (bias corrected MLE)	0.662
Theta hat (MLE)	0.647	Theta star (bias corrected MLE)	0.969
nu hat (MLE)	13.89	nu star (bias corrected)	9.272
MLE Mean (bias corrected)	0.642	MLE Sd (bias corrected)	0.789

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.259	nu hat (KM)	11.41
Approximate Chi Square Value (11.41, α)	4.843	Adjusted Chi Square Value (11.41, β)	4.526
95% Gamma Approximate KM-UCL (use when n>=50)	0.62	95% Gamma Adjusted KM-UCL (use when n<50)	0.663

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.211
Maximum	2.5	Median	0.01
SD	0.547	CV	2.592
k hat (MLE)	0.352	k star (bias corrected MLE)	0.334
Theta hat (MLE)	0.6	Theta star (bias corrected MLE)	0.632
nu hat (MLE)	15.47	nu star (bias corrected)	14.7
MLE Mean (bias corrected)	0.211	MLE Sd (bias corrected)	0.365
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (14.70, α)	7.052	Adjusted Chi Square Value (14.70, β)	6.658
95% Gamma Approximate UCL (use when n>=50)	0.44	95% Gamma Adjusted UCL (use when n<50)	0.466

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.194	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.225	Mean in Log Scale	-2.821
SD in Original Scale	0.542	SD in Log Scale	1.478
95% t UCL (assumes normality of ROS data)	0.424	95% Percentile Bootstrap UCL	0.439
95% BCA Bootstrap UCL	0.557	95% Bootstrap t UCL	1.075
95% H-UCL (Log ROS)	0.516		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.012	95% H-UCL (KM -Log)	0.324
KM SD (logged)	0.899	95% Critical H Value (KM-Log)	2.447
KM Standard Error of Mean (logged)	0.209		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.252	Mean in Log Scale	-2.226
SD in Original Scale	0.533	SD in Log Scale	1.097
95% t UCL (Assumes normality)	0.448	95% H-Stat UCL	0.378

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.468	95% KM (Percentile Bootstrap) UCL	0.474

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Aluminum

General Statistics

Total Number of Observations	51	Number of Distinct Observations	35
		Number of Missing Observations	4
Minimum	5910	Mean	18463
Maximum	35000	Median	17900
SD	3902	Std. Error of Mean	546.3
Coefficient of Variation	0.211	Skewness	1.25

Normal GOF Test

Shapiro Wilk Test Statistic	0.844	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	5.4942E-7	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.189	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19379	95% Adjusted-CLT UCL (Chen-1995)	19464
		95% Modified-t UCL (Johnson-1978)	19394

Gamma GOF Test

A-D Test Statistic	2.635	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.164	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	22.04	k star (bias corrected MLE)	20.76
Theta hat (MLE)	837.6	Theta star (bias corrected MLE)	889.4
nu hat (MLE)	2248	nu star (bias corrected)	2117
MLE Mean (bias corrected)	18463	MLE Sd (bias corrected)	4052
		Approximate Chi Square Value (0.05)	2012
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	2009

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19435	95% Adjusted Gamma UCL (use when n<50)	19464

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.798	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	5.4119E-9	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.684	Mean of logged Data	9.801
Maximum of Logged Data	10.46	SD of logged Data	0.226

Assuming Lognormal Distribution

95% H-UCL	19561	90% Chebyshev (MVUE) UCL	20281
95% Chebyshev (MVUE) UCL	21086	97.5% Chebyshev (MVUE) UCL	22203
99% Chebyshev (MVUE) UCL	24398		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	19362	95% Jackknife UCL	19379
95% Standard Bootstrap UCL	19348	95% Bootstrap-t UCL	19538
95% Hall's Bootstrap UCL	19766	95% Percentile Bootstrap UCL	19365
95% BCA Bootstrap UCL	19522		
90% Chebyshev(Mean, Sd) UCL	20102	95% Chebyshev(Mean, Sd) UCL	20844
97.5% Chebyshev(Mean, Sd) UCL	21875	99% Chebyshev(Mean, Sd) UCL	23899

Suggested UCL to Use

95% Student's-t UCL	19379	or 95% Modified-t UCL	19394

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Arsenic

General Statistics

Total Number of Observations	51	Number of Distinct Observations	26
		Number of Missing Observations	4
Minimum	4	Mean	5.994
Maximum	16.1	Median	5.2
SD	2.308	Std. Error of Mean	0.323
Coefficient of Variation	0.385	Skewness	2.835

Normal GOF Test

Shapiro Wilk Test Statistic	0.641	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	5.884E-15	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.536	95% Adjusted-CLT UCL (Chen-1995)	6.663
		95% Modified-t UCL (Johnson-1978)	6.557

Gamma GOF Test

A-D Test Statistic	4.757	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.254	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	10.5	k star (bias corrected MLE)	9.896
Theta hat (MLE)	0.571	Theta star (bias corrected MLE)	0.606
nu hat (MLE)	1071	nu star (bias corrected)	1009
MLE Mean (bias corrected)	5.994	MLE Sd (bias corrected)	1.905
		Approximate Chi Square Value (0.05)	936.6
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	934.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6.46	95% Adjusted Gamma UCL (use when n<50)	6.474

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.3486E-9	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.239	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.386	Mean of logged Data	1.742
Maximum of Logged Data	2.779	SD of logged Data	0.286

Assuming Lognormal Distribution

95% H-UCL	6.378	90% Chebyshev (MVUE) UCL	6.671
95% Chebyshev (MVUE) UCL	7	97.5% Chebyshev (MVUE) UCL	7.456
99% Chebyshev (MVUE) UCL	8.353		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	6.526	95% Jackknife UCL	6.536
95% Standard Bootstrap UCL	6.505	95% Bootstrap-t UCL	6.796
95% Hall's Bootstrap UCL	6.693	95% Percentile Bootstrap UCL	6.516
95% BCA Bootstrap UCL	6.688		
90% Chebyshev(Mean, Sd) UCL	6.964	95% Chebyshev(Mean, Sd) UCL	7.403
97.5% Chebyshev(Mean, Sd) UCL	8.013	99% Chebyshev(Mean, Sd) UCL	9.21

Suggested UCL to Use

95% Student's-t UCL	6.536	or 95% Modified-t UCL	6.557

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Cadmium

General Statistics

Total Number of Observations	51	Number of Distinct Observations	42
		Number of Missing Observations	4
Number of Detects	48	Number of Non-Detects	3
Number of Distinct Detects	40	Number of Distinct Non-Detects	3
Minimum Detect	0.76	Minimum Non-Detect	0.86
Maximum Detect	1100	Maximum Non-Detect	1.1
Variance Detects	24877	Percent Non-Detects	5.882%
Mean Detects	30.43	SD Detects	157.7
Median Detects	7.55	CV Detects	5.183
Skewness Detects	6.92	Kurtosis Detects	47.92
Mean of Logged Detects	1.995	SD of Logged Detects	0.952

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.163	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.491	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	28.69	Standard Error of Mean	21.45
SD	151.6	95% KM (BCA) UCL	71.67
95% KM (t) UCL	64.63	95% KM (Percentile Bootstrap) UCL	71.4
95% KM (z) UCL	63.97	95% KM Bootstrap t UCL	1001
90% KM Chebyshev UCL	93.03	95% KM Chebyshev UCL	122.2
97.5% KM Chebyshev UCL	162.6	99% KM Chebyshev UCL	242.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	12.33	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.825	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.451	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.136	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.454	k star (bias corrected MLE)	0.439
Theta hat (MLE)	67.04	Theta star (bias corrected MLE)	69.25
nu hat (MLE)	43.58	nu star (bias corrected)	42.19
MLE Mean (bias corrected)	30.43	MLE Sd (bias corrected)	45.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0358	nu hat (KM)	3.653
Approximate Chi Square Value (3.65, α)	0.59	Adjusted Chi Square Value (3.65, β)	0.557
95% Gamma Approximate KM-UCL (use when n>=50)	177.7	95% Gamma Adjusted KM-UCL (use when n<50)	188.1

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	28.64
Maximum	1100	Median	7.4
SD	153.1	CV	5.345
k hat (MLE)	0.38	k star (bias corrected MLE)	0.37
Theta hat (MLE)	75.45	Theta star (bias corrected MLE)	77.34
nu hat (MLE)	38.72	nu star (bias corrected)	37.77
MLE Mean (bias corrected)	28.64	MLE Sd (bias corrected)	47.06
		Adjusted Level of Significance (β)	0.0453
Approximate Chi Square Value (37.77, α)	24.7	Adjusted Chi Square Value (37.77, β)	24.39
95% Gamma Approximate UCL (use when n>=50)	43.8	95% Gamma Adjusted UCL (use when n<50)	44.35

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.684	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.29	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	28.73	Mean in Log Scale	1.9
SD in Original Scale	153.1	SD in Log Scale	0.998
95% t UCL (assumes normality of ROS data)	64.65	95% Percentile Bootstrap UCL	71.58
95% BCA Bootstrap UCL	93.79	95% Bootstrap t UCL	1030
95% H-UCL (Log ROS)	15.24		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	28.67	Mean in Log Scale	1.836
SD in Original Scale	153.1	SD in Log Scale	1.125
95% t UCL (Assumes normality)	64.59	95% H-Stat UCL	17.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	122.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Chromium

General Statistics

Total Number of Observations	51	Number of Distinct Observations	46
		Number of Missing Observations	4
Minimum	10.6	Mean	37.04
Maximum	446	Median	28.5
SD	58.64	Std. Error of Mean	8.212
Coefficient of Variation	1.583	Skewness	7.053

Normal GOF Test

Shapiro Wilk Test Statistic	0.204	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.436	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	50.81	95% Adjusted-CLT UCL (Chen-1995)	59.22
		95% Modified-t UCL (Johnson-1978)	52.16

Gamma GOF Test

A-D Test Statistic	11.34	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.76	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.365	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.125	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.495	k star (bias corrected MLE)	2.362
Theta hat (MLE)	14.85	Theta star (bias corrected MLE)	15.69
nu hat (MLE)	254.5	nu star (bias corrected)	240.9
MLE Mean (bias corrected)	37.04	MLE Sd (bias corrected)	24.11
		Approximate Chi Square Value (0.05)	205.9
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	205

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	43.33	95% Adjusted Gamma UCL (use when n<50)	43.52

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.518	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.29	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.361	Mean of logged Data	3.399
Maximum of Logged Data	6.1	SD of logged Data	0.435

Assuming Lognormal Distribution

95% H-UCL	36.82	90% Chebyshev (MVUE) UCL	39.04
95% Chebyshev (MVUE) UCL	41.86	97.5% Chebyshev (MVUE) UCL	45.77
99% Chebyshev (MVUE) UCL	53.46		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	50.55	95% Jackknife UCL	50.81
95% Standard Bootstrap UCL	50.87	95% Bootstrap-t UCL	160.1
95% Hall's Bootstrap UCL	128.1	95% Percentile Bootstrap UCL	53.34
95% BCA Bootstrap UCL	69.49		
90% Chebyshev(Mean, Sd) UCL	61.68	95% Chebyshev(Mean, Sd) UCL	72.84
97.5% Chebyshev(Mean, Sd) UCL	88.33	99% Chebyshev(Mean, Sd) UCL	118.8

Suggested UCL to Use

95% Student's-t UCL	50.81	or 95% Modified-t UCL	52.16

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Cobalt

General Statistics

Total Number of Observations	51	Number of Distinct Observations	28
		Number of Missing Observations	4
Minimum	9	Mean	12.12
Maximum	19.7	Median	12.2
SD	1.613	Std. Error of Mean	0.226
Coefficient of Variation	0.133	Skewness	1.851

Normal GOF Test

Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	5.1121E-6	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.5	95% Adjusted-CLT UCL (Chen-1995)	12.56
		95% Modified-t UCL (Johnson-1978)	12.51

Gamma GOF Test

A-D Test Statistic	1.106	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.118	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	63.45	k star (bias corrected MLE)	59.73
Theta hat (MLE)	0.191	Theta star (bias corrected MLE)	0.203
nu hat (MLE)	6472	nu star (bias corrected)	6092
MLE Mean (bias corrected)	12.12	MLE Sd (bias corrected)	1.569
		Approximate Chi Square Value (0.05)	5912
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	5907

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	12.49	95% Adjusted Gamma UCL (use when n<50)	12.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00528	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.111	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.197	Mean of logged Data	2.487
Maximum of Logged Data	2.981	SD of logged Data	0.125

Assuming Lognormal Distribution

95% H-UCL	12.49	90% Chebyshev (MVUE) UCL	12.76
95% Chebyshev (MVUE) UCL	13.05	97.5% Chebyshev (MVUE) UCL	13.45
99% Chebyshev (MVUE) UCL	14.24		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	12.5	95% Jackknife UCL	12.5
95% Standard Bootstrap UCL	12.5	95% Bootstrap-t UCL	12.58
95% Hall's Bootstrap UCL	12.69	95% Percentile Bootstrap UCL	12.51
95% BCA Bootstrap UCL	12.57		
90% Chebyshev(Mean, Sd) UCL	12.8	95% Chebyshev(Mean, Sd) UCL	13.11
97.5% Chebyshev(Mean, Sd) UCL	13.53	99% Chebyshev(Mean, Sd) UCL	14.37

Suggested UCL to Use

95% Approximate Gamma UCL	12.49

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Copper

General Statistics

Total Number of Observations	51	Number of Distinct Observations	50
		Number of Missing Observations	4
Minimum	38.9	Mean	491.5
Maximum	4180	Median	411
SD	599.7	Std. Error of Mean	83.98
Coefficient of Variation	1.22	Skewness	5.011

Normal GOF Test

Shapiro Wilk Test Statistic	0.508	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.312	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	632.2	95% Adjusted-CLT UCL (Chen-1995)	692.6
		95% Modified-t UCL (Johnson-1978)	642

Gamma GOF Test

A-D Test Statistic	1.892	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.767	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.194	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.126	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.544	k star (bias corrected MLE)	1.466
Theta hat (MLE)	318.3	Theta star (bias corrected MLE)	335.2
nu hat (MLE)	157.5	nu star (bias corrected)	149.6
MLE Mean (bias corrected)	491.5	MLE Sd (bias corrected)	405.9
		Approximate Chi Square Value (0.05)	122.3
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	121.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	601	95% Adjusted Gamma UCL (use when n<50)	604.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	5.3060E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.145	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.661	Mean of logged Data	5.84
Maximum of Logged Data	8.338	SD of logged Data	0.864

Assuming Lognormal Distribution

95% H-UCL	651.3	90% Chebyshev (MVUE) UCL	698.9
95% Chebyshev (MVUE) UCL	791.4	97.5% Chebyshev (MVUE) UCL	919.9
99% Chebyshev (MVUE) UCL	1172		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	629.6	95% Jackknife UCL	632.2
95% Standard Bootstrap UCL	623.6	95% Bootstrap-t UCL	830.9
95% Hall's Bootstrap UCL	1252	95% Percentile Bootstrap UCL	641
95% BCA Bootstrap UCL	708		
90% Chebyshev(Mean, Sd) UCL	743.4	95% Chebyshev(Mean, Sd) UCL	857.5
97.5% Chebyshev(Mean, Sd) UCL	1016	99% Chebyshev(Mean, Sd) UCL	1327

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	857.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Lead

General Statistics

Total Number of Observations	51	Number of Distinct Observations	51
		Number of Missing Observations	4
Minimum	19.8	Mean	83.57
Maximum	998	Median	59.3
SD	139.7	Std. Error of Mean	19.56
Coefficient of Variation	1.672	Skewness	5.989

Normal GOF Test

Shapiro Wilk Test Statistic	0.321	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.414	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	116.4	95% Adjusted-CLT UCL (Chen-1995)	133.3
		95% Modified-t UCL (Johnson-1978)	119.1

Gamma GOF Test

A-D Test Statistic	6.887	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.766	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.326	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.126	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.659	k star (bias corrected MLE)	1.575
Theta hat (MLE)	50.36	Theta star (bias corrected MLE)	53.06
nu hat (MLE)	169.3	nu star (bias corrected)	160.6
MLE Mean (bias corrected)	83.57	MLE Sd (bias corrected)	66.59
		Approximate Chi Square Value (0.05)	132.3
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	131.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	101.4	95% Adjusted Gamma UCL (use when n<50)	102

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.779	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	9.567E-10	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.241	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.986	Mean of logged Data	4.095
Maximum of Logged Data	6.906	SD of logged Data	0.624

Assuming Lognormal Distribution

95% H-UCL	86.72	90% Chebyshev (MVUE) UCL	93.08
95% Chebyshev (MVUE) UCL	102.4	97.5% Chebyshev (MVUE) UCL	115.2
99% Chebyshev (MVUE) UCL	140.5		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	115.7	95% Jackknife UCL	116.4
95% Standard Bootstrap UCL	114.6	95% Bootstrap-t UCL	220.9
95% Hall's Bootstrap UCL	226.2	95% Percentile Bootstrap UCL	120.3
95% BCA Bootstrap UCL	145.4		
90% Chebyshev(Mean, Sd) UCL	142.3	95% Chebyshev(Mean, Sd) UCL	168.8
97.5% Chebyshev(Mean, Sd) UCL	205.7	99% Chebyshev(Mean, Sd) UCL	278.2

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	168.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Manganese

General Statistics

Total Number of Observations	51	Number of Distinct Observations	45
		Number of Missing Observations	4
Minimum	361	Mean	610.9
Maximum	1080	Median	599
SD	134.9	Std. Error of Mean	18.89
Coefficient of Variation	0.221	Skewness	1.538

Normal GOF Test

Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	4.6597E-6	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	642.5	95% Adjusted-CLT UCL (Chen-1995)	646.3
		95% Modified-t UCL (Johnson-1978)	643.2

Gamma GOF Test

A-D Test Statistic	1.34	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.148	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	23.45	k star (bias corrected MLE)	22.09
Theta hat (MLE)	26.04	Theta star (bias corrected MLE)	27.66
nu hat (MLE)	2392	nu star (bias corrected)	2253
MLE Mean (bias corrected)	610.9	MLE Sd (bias corrected)	130
		Approximate Chi Square Value (0.05)	2144
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	2141

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	642	95% Adjusted Gamma UCL (use when n<50)	642.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0108	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.138	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.889	Mean of logged Data	6.393
Maximum of Logged Data	6.985	SD of logged Data	0.206

Assuming Lognormal Distribution

95% H-UCL	642	90% Chebyshev (MVUE) UCL	663.7
95% Chebyshev (MVUE) UCL	687.8	97.5% Chebyshev (MVUE) UCL	721.3
99% Chebyshev (MVUE) UCL	787.1		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	641.9	95% Jackknife UCL	642.5
95% Standard Bootstrap UCL	641.2	95% Bootstrap-t UCL	647.4
95% Hall's Bootstrap UCL	649.3	95% Percentile Bootstrap UCL	643.5
95% BCA Bootstrap UCL	644.4		
90% Chebyshev(Mean, Sd) UCL	667.5	95% Chebyshev(Mean, Sd) UCL	693.2
97.5% Chebyshev(Mean, Sd) UCL	728.9	99% Chebyshev(Mean, Sd) UCL	798.9

Suggested UCL to Use

95% Student's-t UCL	642.5	or 95% Modified-t UCL	643.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Silver

General Statistics

Total Number of Observations	51	Number of Distinct Observations	32
		Number of Missing Observations	4
Number of Detects	41	Number of Non-Detects	10
Number of Distinct Detects	25	Number of Distinct Non-Detects	8
Minimum Detect	0.23	Minimum Non-Detect	0.04
Maximum Detect	205	Maximum Non-Detect	3
Variance Detects	995.3	Percent Non-Detects	19.61%
Mean Detects	8.137	SD Detects	31.55
Median Detects	3.4	CV Detects	3.877
Skewness Detects	6.381	Kurtosis Detects	40.81
Mean of Logged Detects	1.102	SD of Logged Detects	0.987

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.192	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.941	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.481	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.138	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	6.65	Standard Error of Mean	3.984
SD	28.1	95% KM (BCA) UCL	14.91
95% KM (t) UCL	13.33	95% KM (Percentile Bootstrap) UCL	14.54
95% KM (z) UCL	13.2	95% KM Bootstrap t UCL	83.5
90% KM Chebyshev UCL	18.6	95% KM Chebyshev UCL	24.02
97.5% KM Chebyshev UCL	31.53	99% KM Chebyshev UCL	46.29

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	8.211	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.802	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.401	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.145	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.619	k star (bias corrected MLE)	0.59
Theta hat (MLE)	13.15	Theta star (bias corrected MLE)	13.8
nu hat (MLE)	50.73	nu star (bias corrected)	48.35
MLE Mean (bias corrected)	8.137	MLE Sd (bias corrected)	10.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.056	nu hat (KM)	5.711
Approximate Chi Square Value (5.71, α)	1.494	Adjusted Chi Square Value (5.71, β)	1.433
95% Gamma Approximate KM-UCL (use when n>=50)	25.42	95% Gamma Adjusted KM-UCL (use when n<50)	26.51

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6.543
Maximum	205	Median	3
SD	28.4	CV	4.341
k hat (MLE)	0.354	k star (bias corrected MLE)	0.346
Theta hat (MLE)	18.48	Theta star (bias corrected MLE)	18.89
nu hat (MLE)	36.12	nu star (bias corrected)	35.33
MLE Mean (bias corrected)	6.543	MLE Sd (bias corrected)	11.12
		Adjusted Level of Significance (β)	0.0453
Approximate Chi Square Value (35.33, α)	22.73	Adjusted Chi Square Value (35.33, β)	22.43
95% Gamma Approximate UCL (use when n>=50)	10.17	95% Gamma Adjusted UCL (use when n<50)	10.3

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.734	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.941	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.138	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	6.685	Mean in Log Scale	0.812
SD in Original Scale	28.37	SD in Log Scale	1.077
95% t UCL (assumes normality of ROS data)	13.34	95% Percentile Bootstrap UCL	14.61
95% BCA Bootstrap UCL	18.91	95% Bootstrap t UCL	89.89
95% H-UCL (Log ROS)	5.787		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.692	Mean in Log Scale	0.721
SD in Original Scale	28.37	SD in Log Scale	1.351
95% t UCL (Assumes normality)	13.35	95% H-Stat UCL	8.579

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	24.02

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Thallium

General Statistics

Total Number of Observations	51	Number of Distinct Observations	26
		Number of Missing Observations	4
Number of Detects	4	Number of Non-Detects	47
Number of Distinct Detects	4	Number of Distinct Non-Detects	24
Minimum Detect	0.1	Minimum Non-Detect	0.09
Maximum Detect	0.27	Maximum Non-Detect	0.44
Variance Detects	0.00527	Percent Non-Detects	92.16%
Mean Detects	0.2	SD Detects	0.0726
Median Detects	0.215	CV Detects	0.363
Skewness Detects	-1.099	Kurtosis Detects	1.5
Mean of Logged Detects	-1.673	SD of Logged Detects	0.437

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.105	Standard Error of Mean	0.00835
SD	0.0411	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.119	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.118	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.13	95% KM Chebyshev UCL	0.141
97.5% KM Chebyshev UCL	0.157	99% KM Chebyshev UCL	0.188

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.389	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.658	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.297	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.395	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	8.059	k star (bias corrected MLE)	2.182
Theta hat (MLE)	0.0248	Theta star (bias corrected MLE)	0.0917
nu hat (MLE)	64.48	nu star (bias corrected)	17.45
MLE Mean (bias corrected)	0.2	MLE Sd (bias corrected)	0.135

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	6.49	nu hat (KM)	662
Approximate Chi Square Value (662.02, α)	603.3	Adjusted Chi Square Value (662.02, β)	601.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.115	95% Gamma Adjusted KM-UCL (use when n<50)	0.115

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0435
Maximum	0.27	Median	0.0211
SD	0.0555	CV	1.275
k hat (MLE)	1.079	k star (bias corrected MLE)	1.029
Theta hat (MLE)	0.0403	Theta star (bias corrected MLE)	0.0423
nu hat (MLE)	110.1	nu star (bias corrected)	105
MLE Mean (bias corrected)	0.0435	MLE Sd (bias corrected)	0.0429
		Adjusted Level of Significance (β)	0.0453
Approximate Chi Square Value (104.96, α)	82.32	Adjusted Chi Square Value (104.96, β)	81.74
95% Gamma Approximate UCL (use when n>=50)	0.0555	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.308	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0673	Mean in Log Scale	-2.84
SD in Original Scale	0.0466	SD in Log Scale	0.491
95% t UCL (assumes normality of ROS data)	0.0783	95% Percentile Bootstrap UCL	0.0787
95% BCA Bootstrap UCL	0.081	95% Bootstrap t UCL	0.0838
95% H-UCL (Log ROS)	0.075		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.304	95% H-UCL (KM -Log)	0.111
KM SD (logged)	0.269	95% Critical H Value (KM-Log)	1.721
KM Standard Error of Mean (logged)	0.0567		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.118	Mean in Log Scale	-2.225
SD in Original Scale	0.0507	SD in Log Scale	0.426
95% t UCL (Assumes normality)	0.13	95% H-Stat UCL	0.132

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.119	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Vanadium

General Statistics

Total Number of Observations	51	Number of Distinct Observations	42
		Number of Missing Observations	4
Minimum	16.6	Mean	29.64
Maximum	53.7	Median	28.7
SD	5.129	Std. Error of Mean	0.718
Coefficient of Variation	0.173	Skewness	2.017

Normal GOF Test

Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	1.6186E-7	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	30.84	95% Adjusted-CLT UCL (Chen-1995)	31.04
		95% Modified-t UCL (Johnson-1978)	30.88

Gamma GOF Test

A-D Test Statistic	1.925	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	38.2	k star (bias corrected MLE)	35.97
Theta hat (MLE)	0.776	Theta star (bias corrected MLE)	0.824
nu hat (MLE)	3897	nu star (bias corrected)	3669
MLE Mean (bias corrected)	29.64	MLE Sd (bias corrected)	4.942
		Approximate Chi Square Value (0.05)	3529
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	3525

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	30.81	95% Adjusted Gamma UCL (use when n<50)	30.85

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	2.0941E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.155	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.809	Mean of logged Data	3.376
Maximum of Logged Data	3.983	SD of logged Data	0.161

Assuming Lognormal Distribution

95% H-UCL	30.81	90% Chebyshev (MVUE) UCL	31.65
95% Chebyshev (MVUE) UCL	32.56	97.5% Chebyshev (MVUE) UCL	33.83
99% Chebyshev (MVUE) UCL	36.33		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	30.82	95% Jackknife UCL	30.84
95% Standard Bootstrap UCL	30.81	95% Bootstrap-t UCL	31.13
95% Hall's Bootstrap UCL	31.59	95% Percentile Bootstrap UCL	30.84
95% BCA Bootstrap UCL	30.89		
90% Chebyshev(Mean, Sd) UCL	31.79	95% Chebyshev(Mean, Sd) UCL	32.77
97.5% Chebyshev(Mean, Sd) UCL	34.12	99% Chebyshev(Mean, Sd) UCL	36.79

Suggested UCL to Use

95% Student's-t UCL	30.84	or 95% Modified-t UCL	30.88

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.2

OD Hill Surface Soil UCL Calculations, continued

Mercury

General Statistics

Total Number of Observations	51	Number of Distinct Observations	36
		Number of Missing Observations	4
Minimum	0.15	Mean	3.2
Maximum	7	Median	3.5
SD	1.734	Std. Error of Mean	0.243
Coefficient of Variation	0.542	Skewness	0.0728

Normal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.223	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0784	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3.607	95% Adjusted-CLT UCL (Chen-1995)	3.602
		95% Modified-t UCL (Johnson-1978)	3.608

Gamma GOF Test

A-D Test Statistic	1.872	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.165	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.126	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.076	k star (bias corrected MLE)	1.967
Theta hat (MLE)	1.541	Theta star (bias corrected MLE)	1.627
nu hat (MLE)	211.8	nu star (bias corrected)	200.7
MLE Mean (bias corrected)	3.2	MLE Sd (bias corrected)	2.282
		Approximate Chi Square Value (0.05)	168.9
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	168

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.803	95% Adjusted Gamma UCL (use when n<50)	3.822

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.811	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.9492E-8	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.199	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.124	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.897	Mean of logged Data	0.904
Maximum of Logged Data	1.946	SD of logged Data	0.899

Assuming Lognormal Distribution

95% H-UCL	4.893	90% Chebyshev (MVUE) UCL	5.242
95% Chebyshev (MVUE) UCL	5.959	97.5% Chebyshev (MVUE) UCL	6.956
99% Chebyshev (MVUE) UCL	8.913		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.6	95% Jackknife UCL	3.607
95% Standard Bootstrap UCL	3.59	95% Bootstrap-t UCL	3.612
95% Hall's Bootstrap UCL	3.637	95% Percentile Bootstrap UCL	3.585
95% BCA Bootstrap UCL	3.58		
90% Chebyshev(Mean, Sd) UCL	3.929	95% Chebyshev(Mean, Sd) UCL	4.259
97.5% Chebyshev(Mean, Sd) UCL	4.717	99% Chebyshev(Mean, Sd) UCL	5.616

Suggested UCL to Use

95% Student's-t UCL	3.607

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.3

OD Hill Area Total Soil Summary Statistics

	General Statistics on Uncensored Data
Date/Time of Computation	9/30/2014 10:23
User Selected Options	
From File	ProUCL_ODH_Total Soil_rev2.xls
Full Precision	OFF

From File: ProUCL_ODH_Total Soil_rev2.xls

General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
2,4-Dinitrotoluene	27	49	12	15	55.56%	0.082	0.38	0.748	6.977	2.641	3.533
2,6-Dinitrotoluene	27	49	2	25	92.59%	0.076	0.46	0.0654	0.0155	0.124	1.903
Benzo(a)pyrene	27	49	8	19	70.37%	0.09	1.9	0.0441	2.52E-04	0.0159	0.36
Benzo(ghi)perylene	27	49	6	21	77.78%	0.1	1.9	0.0475	1.06E-04	0.0103	0.216
N-Nitrosodipropylami	27	49	5	22	81.48%	0.08	0.53	0.0879	0.0883	0.297	3.382
Phenanthrene	27	49	9	18	66.67%	0.08	1.9	0.0342	5.97E-05	0.00773	0.226
Nitroglycerine	26	31	1	25	96.15%	0.11	0.16	0.163	0.0715	0.267	1.635
Aroclor-1254	27	49	4	23	85.19%	0.0047	0.05	0.106	0.15	0.387	3.64
Aluminum	71	5	71	0	0.00%	N/A	N/A	17810	15751247	3969	0.223
Antimony	71	5	27	44	61.97%	0.11	13.4	0.527	0.756	0.869	1.651
Arsenic	71	5	71	0	0.00%	N/A	N/A	5.876	4.438	2.107	0.359
Cadmium	69	7	65	4	5.80%	0.01	1.1	22.85	17082	130.7	5.72
Chromium	71	5	71	0	0.00%	N/A	N/A	34.11	2489	49.89	1.462
Cobalt	71	5	71	0	0.00%	N/A	N/A	11.99	3.392	1.842	0.154
Copper	71	5	71	0	0.00%	N/A	N/A	598.5	994747	997.4	1.667
Lead	71	5	71	0	0.00%	N/A	N/A	76.78	14334	119.7	1.559
Manganese	71	5	71	0	0.00%	N/A	N/A	604.5	26951	164.2	0.272
Silver	71	5	59	12	16.90%	0.04	3	6.49	609.9	24.7	3.805
Thallium	71	5	6	65	91.55%	0.08	0.44	0.0978	0.00193	0.0439	0.449
Vanadium	71	5	71	0	0.00%	N/A	N/A	28.67	29.49	5.431	0.189
Mercury	71	5	71	0	0.00%	N/A	N/A	3.548	4.392	2.096	0.591

Table A.2.3

OD Hill Area Total Soil Summary Statistics, continued

General Statistics for Raw Data Sets using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
2,4-Dinitrotoluene	12	49	0.059	14	1.588	0.245	15.74	3.967	0.219	3.299	2.498
2,6-Dinitrotoluene	2	49	0.041	0.7	0.371	0.371	0.217	0.466	0.489	N/A	1.258
Benzo(a)pyrene	8	49	0.028	0.082	0.0441	0.0435	2.88E-04	0.017	0.00667	1.778	0.384
Benzo(ghi)perylene	6	49	0.034	0.066	0.0475	0.0465	1.27E-04	0.0113	0.0104	0.717	0.237
N-Nitrosodipropylami	5	49	0.02	1.6	0.357	0.03	0.484	0.696	0.0148	2.221	1.949
Phenanthrene	9	49	0.024	0.046	0.0342	0.034	6.72E-05	0.0082	0.0133	0.0115	0.24
Nitroglycerine	1	31	1.5	1.5	1.5	1.5	N/A	N/A	0	N/A	N/A
Aroclor-1254	4	49	0.074	2	0.691	0.345	0.815	0.903	0.375	1.641	1.306
Aluminum	71	5	5910	35000	17810	17700	15751247	3969	2224	0.889	0.223
Antimony	27	5	0.14	5.1	0.974	0.62	1.287	1.134	0.489	2.386	1.164
Arsenic	71	5	3.3	16.1	5.876	5.2	4.438	2.107	0.741	2.787	0.359
Cadmium	65	7	0.04	1100	24.24	7.5	18382	135.6	2.076	8.051	5.593
Chromium	71	5	10.6	446	34.11	27.9	2489	49.89	3.855	8.267	1.462
Cobalt	71	5	6.4	19.7	11.99	12.1	3.392	1.842	1.334	0.794	0.154
Copper	71	5	24.7	7310	598.5	411	994747	997.4	222.4	5.254	1.667
Lead	71	5	11.2	998	76.78	59.3	14334	119.7	14.97	6.883	1.559
Manganese	71	5	361	1380	604.5	583	26951	164.2	96.37	2.066	0.272
Silver	59	5	0.12	205	7.703	3.4	737.7	27.16	1.334	6.926	3.526
Thallium	6	5	0.1	0.27	0.2	0.215	0.00416	0.0645	0.0667	-0.704	0.322
Vanadium	71	5	16.6	53.7	28.67	28.5	29.49	5.431	3.41	1.226	0.189
Mercury	71	5	0.02	9.1	3.548	3.5	4.392	2.096	1.631	0.489	0.591

Percentiles using all Detects (Ds) and Non-Detects (NDs)

Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
2,4-Dinitrotoluene	27	49	0.0836	0.0944	0.0965	0.13	0.27	0.344	0.56	1.999	11.01
2,6-Dinitrotoluene	27	49	0.087	0.0892	0.09	0.099	0.365	0.37	0.394	0.442	0.638
Benzo(a)pyrene	27	49	0.04	0.0452	0.064	0.1	0.115	0.12	0.396	0.434	1.52
Benzo(ghi)perylene	27	49	0.0468	0.0728	0.105	0.12	0.245	0.36	0.428	0.482	1.536
N-Nitrosodipropylami	27	49	0.06	0.0912	0.093	0.097	0.385	0.414	0.476	0.521	1.322
Phenanthrene	27	49	0.0304	0.038	0.041	0.094	0.0985	0.1	0.368	0.408	1.515
Nitroglycerine	26	31	0.125	0.13	0.13	0.14	0.15	0.15	0.155	0.16	1.165
Aroclor-1254	27	49	0.0054	0.0055	0.0055	0.036	0.041	0.0452	0.0884	0.439	1.631
Aluminum	71	5	14400	15000	16350	17700	19400	20200	21700	23200	30030
Antimony	71	5	0.14	0.19	0.195	0.38	1.55	3.1	9.7	10.95	12.7
Arsenic	71	5	4.2	4.7	4.85	5.2	6.1	6.4	7.9	9.85	13.65
Cadmium	69	7	1.5	4.16	4.7	7.4	8.6	8.74	10.44	14.3	369.4
Chromium	71	5	22.8	25	25.5	27.9	30.75	31.4	35.3	38.5	167.7
Cobalt	71	5	9.8	10.8	11.15	12.1	12.85	12.9	13.5	14.45	17.74
Copper	71	5	115	209	236.5	411	536.5	633	853	1510	5119
Lead	71	5	28.3	42.7	49.45	59.3	69.3	72.3	86.3	127	545.8
Manganese	71	5	420	506	524.5	583	652	662	727	881	1170
Silver	71	5	0.38	1.2	1.4	3	3.85	4	5	8	99.09
Thallium	71	5	0.1	0.14	0.16	0.19	0.25	0.28	0.32	0.355	0.398
Vanadium	71	5	22.3	25.7	26.8	28.5	31.15	31.7	32.8	37.6	44.11
Mercury	71	5	0.48	1.7	2.2	3.5	4.4	4.7	6.4	7.3	9.1

Table A.2.4

OD Hill Area Total Soil UCL calculations

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/30/2014 10:25:03 AM
From File	ProUCL ODH Total Soil rev2.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

2,4-Dinitrotoluene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	21
		Number of Missing Observations	49
Number of Detects	12	Number of Non-Detects	15
Number of Distinct Detects	12	Number of Distinct Non-Detects	10
Minimum Detect	0.059	Minimum Non-Detect	0.082
Maximum Detect	14	Maximum Non-Detect	0.38
Variance Detects	15.74	Percent Non-Detects	55.56%
Mean Detects	1.588	SD Detects	3.967
Median Detects	0.245	CV Detects	2.498
Skewness Detects	3.299	Kurtosis Detects	11.09
Mean of Logged Detects	-1.081	SD of Logged Detects	1.561

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.433	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.409	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.748	Standard Error of Mean	0.531
SD	2.641	95% KM (BCA) UCL	1.752
95% KM (t) UCL	1.653	95% KM (Percentile Bootstrap) UCL	1.764
95% KM (z) UCL	1.621	95% KM Bootstrap t UCL	10.9
90% KM Chebyshev UCL	2.34	95% KM Chebyshev UCL	3.062
97.5% KM Chebyshev UCL	4.063	99% KM Chebyshev UCL	6.031

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.562	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.8	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.334	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.261	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.422	k star (bias corrected MLE)	0.372
Theta hat (MLE)	3.759	Theta star (bias corrected MLE)	4.264
nu hat (MLE)	10.14	nu star (bias corrected)	8.938
MLE Mean (bias corrected)	1.588	MLE Sd (bias corrected)	2.602

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0801	nu hat (KM)	4.326
Approximate Chi Square Value (4.33, α)	0.855	Adjusted Chi Square Value (4.33, β)	0.764
95% Gamma Approximate KM-UCL (use when n>=50)	3.785	% Gamma Adjusted KM-UCL (use when n<50)	4.236

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.711
Maximum	14	Median	0.01
SD	2.701	CV	3.797
k hat (MLE)	0.261	k star (bias corrected MLE)	0.257
Theta hat (MLE)	2.722	Theta star (bias corrected MLE)	2.768
nu hat (MLE)	14.11	nu star (bias corrected)	13.88
MLE Mean (bias corrected)	0.711	MLE Sd (bias corrected)	1.403
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (13.88, α)	6.488	Adjusted Chi Square Value (13.88, β)	6.166
95% Gamma Approximate UCL (use when n>=50)	1.522	95% Gamma Adjusted UCL (use when n<50)	1.601

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.734	Mean in Log Scale	-2.209
SD in Original Scale	2.695	SD in Log Scale	1.502
95% t UCL (assumes normality of ROS data)	1.619	95% Percentile Bootstrap UCL	1.694
95% BCA Bootstrap UCL	2.312	95% Bootstrap t UCL	10.84
95% H-UCL (Log ROS)	0.881		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.943	95% H-UCL (KM -Log)	0.667
KM SD (logged)	1.275	95% Critical H Value (KM-Log)	2.9
KM Standard Error of Mean (logged)	0.263		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.745	Mean in Log Scale	-2.028
SD in Original Scale	2.692	SD in Log Scale	1.376
95% t UCL (Assumes normality)	1.629	95% H-Stat UCL	0.771

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 4.063

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Benzo(ghi)perylene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	16
		Number of Missing Observations	49
Number of Detects	6	Number of Non-Detects	21
Number of Distinct Detects	6	Number of Distinct Non-Detects	10
Minimum Detect	0.034	Minimum Non-Detect	0.1
Maximum Detect	0.066	Maximum Non-Detect	1.9
Variance Detects	1.2670E-4	Percent Non-Detects	77.78%
Mean Detects	0.0475	SD Detects	0.0113
Median Detects	0.0465	CV Detects	0.237
Skewness Detects	0.717	Kurtosis Detects	0.575
Mean of Logged Detects	-3.07	SD of Logged Detects	0.233

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0475	Standard Error of Mean	0.0046
SD	0.0103	95% KM (BCA) UCL	0.055
95% KM (t) UCL	0.0553	95% KM (Percentile Bootstrap) UCL	0.055
95% KM (z) UCL	0.0551	95% KM Bootstrap t UCL	0.0588
90% KM Chebyshev UCL	0.0613	95% KM Chebyshev UCL	0.0675
97.5% KM Chebyshev UCL	0.0762	99% KM Chebyshev UCL	0.0932

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.164	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.697	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.129	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.332	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	22.12	k star (bias corrected MLE)	11.17
Theta hat (MLE)	0.00215	Theta star (bias corrected MLE)	0.00425
nu hat (MLE)	265.4	nu star (bias corrected)	134.1
MLE Mean (bias corrected)	0.0475	MLE Sd (bias corrected)	0.0142

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	21.37	nu hat (KM)	1154
Approximate Chi Square Value (N/A, α)	1076	Adjusted Chi Square Value (N/A, β)	1071
95% Gamma Approximate KM-UCL (use when n>=50)	0.0509	% Gamma Adjusted KM-UCL (use when n<50)	0.0512

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0303	Mean	0.0474
Maximum	0.0671	Median	0.047
SD	0.00872	CV	0.184
k hat (MLE)	30.69	k star (bias corrected MLE)	27.31
Theta hat (MLE)	0.00154	Theta star (bias corrected MLE)	0.00173
nu hat (MLE)	1658	nu star (bias corrected)	1475
MLE Mean (bias corrected)	0.0474	MLE Sd (bias corrected)	0.00906
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (N/A, α)	1387	Adjusted Chi Square Value (N/A, β)	1381
95% Gamma Approximate UCL (use when n>=50)	0.0504	95% Gamma Adjusted UCL (use when n<50)	0.0506

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.992	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0472	Mean in Log Scale	-3.07
SD in Original Scale	0.00866	SD in Log Scale	0.181
95% t UCL (assumes normality of ROS data)	0.05	95% Percentile Bootstrap UCL	0.0499
95% BCA Bootstrap UCL	0.05	95% Bootstrap t UCL	0.0504
95% H-UCL (Log ROS)	0.0502		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.07	95% H-UCL (KM -Log)	0.0511
KM SD (logged)	0.212	95% Critical H Value (KM-Log)	1.767
KM Standard Error of Mean (logged)	0.095		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.122	Mean in Log Scale	-2.504
SD in Original Scale	0.178	SD in Log Scale	0.755
95% t UCL (Assumes normality)	0.18	95% H-Stat UCL	0.151

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0553	95% KM (Percentile Bootstrap) UCL	0.055

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Phenanthrene

General Statistics

Total Number of Observations	27	Number of Distinct Observations	19
		Number of Missing Observations	49
Number of Detects	9	Number of Non-Detects	18
Number of Distinct Detects	6	Number of Distinct Non-Detects	13
Minimum Detect	0.024	Minimum Non-Detect	0.08
Maximum Detect	0.046	Maximum Non-Detect	1.9
Variance Detects	6.7194E-5	Percent Non-Detects	66.67%
Mean Detects	0.0342	SD Detects	0.0082
Median Detects	0.034	CV Detects	0.24
Skewness Detects	0.0115	Kurtosis Detects	-1.357
Mean of Logged Detects	-3.401	SD of Logged Detects	0.247

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0342	Standard Error of Mean	0.00273
SD	0.00773	95% KM (BCA) UCL	0.0386
95% KM (t) UCL	0.0389	95% KM (Percentile Bootstrap) UCL	0.0386
95% KM (z) UCL	0.0387	95% KM Bootstrap t UCL	0.0392
90% KM Chebyshev UCL	0.0424	95% KM Chebyshev UCL	0.0461
97.5% KM Chebyshev UCL	0.0513	99% KM Chebyshev UCL	0.0614

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.477	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.222	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	18.97	k star (bias corrected MLE)	12.72
Theta hat (MLE)	0.0018	Theta star (bias corrected MLE)	0.00269
nu hat (MLE)	341.4	nu star (bias corrected)	228.9
MLE Mean (bias corrected)	0.0342	MLE Sd (bias corrected)	0.0096

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	19.61	nu hat (KM)	1059
Approximate Chi Square Value (N/A, α)	984.3	Adjusted Chi Square Value (N/A, β)	979.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.0368	% Gamma Adjusted KM-UCL (use when n<50)	0.037

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.024	Mean	0.034
Maximum	0.046	Median	0.0338
SD	0.00529	CV	0.156
k hat (MLE)	42.07	k star (bias corrected MLE)	37.42
Theta hat (MLE)	8.0767E-4	Theta star (bias corrected MLE)	9.0802E-4
nu hat (MLE)	2272	nu star (bias corrected)	2021
MLE Mean (bias corrected)	0.034	MLE Sd (bias corrected)	0.00555
		Adjusted Level of Significance (β)	0.0401
Approximate Chi Square Value (N/A, α)	1917	Adjusted Chi Square Value (N/A, β)	1911
95% Gamma Approximate UCL (use when n>=50)	0.0358	95% Gamma Adjusted UCL (use when n<50)	0.0359

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.889	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0337	Mean in Log Scale	-3.401
SD in Original Scale	0.0053	SD in Log Scale	0.159
95% t UCL (assumes normality of ROS data)	0.0355	95% Percentile Bootstrap UCL	0.0353
95% BCA Bootstrap UCL	0.0354	95% Bootstrap t UCL	0.0355
95% H-UCL (Log ROS)	0.0356		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.401	95% H-UCL (KM -Log)	0.0371
KM SD (logged)	0.233	95% Critical H Value (KM-Log)	1.779
KM Standard Error of Mean (logged)	0.0824		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0927	Mean in Log Scale	-2.9
SD in Original Scale	0.178	SD in Log Scale	0.784
95% t UCL (Assumes normality)	0.151	95% H-Stat UCL	0.106

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0389	95% KM (Percentile Bootstrap) UCL	0.0386

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Aluminum

General Statistics

Total Number of Observations	71	Number of Distinct Observations	47
		Number of Missing Observations	5
Minimum	5910	Mean	17810
Maximum	35000	Median	17700
SD	3969	Std. Error of Mean	471
Coefficient of Variation	0.223	Skewness	0.889

Normal GOF Test

Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	6.3489E-4	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	18595	95% Adjusted-CLT UCL (Chen-1995)	18638
		95% Modified-t UCL (Johnson-1978)	18603

Gamma GOF Test

A-D Test Statistic	1.756	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.142	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	19.7	k star (bias corrected MLE)	18.88
Theta hat (MLE)	904.1	Theta star (bias corrected MLE)	943.5
nu hat (MLE)	2797	nu star (bias corrected)	2680
MLE Mean (bias corrected)	17810	MLE Sd (bias corrected)	4099
		Approximate Chi Square Value (0.05)	2561
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	2559

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	18639	95% Adjusted Gamma UCL (use when n<50)	18657

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.0125E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.684	Mean of logged Data	9.762
Maximum of Logged Data	10.46	SD of logged Data	0.236

Assuming Lognormal Distribution

95% H-UCL	18738	90% Chebyshev (MVUE) UCL	19362
95% Chebyshev (MVUE) UCL	20050	97.5% Chebyshev (MVUE) UCL	21005
99% Chebyshev (MVUE) UCL	22881		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	18585	95% Jackknife UCL	18595
95% Standard Bootstrap UCL	18565	95% Bootstrap-t UCL	18668
95% Hall's Bootstrap UCL	18733	95% Percentile Bootstrap UCL	18575
95% BCA Bootstrap UCL	18586		
90% Chebyshev(Mean, Sd) UCL	19223	95% Chebyshev(Mean, Sd) UCL	19863
97.5% Chebyshev(Mean, Sd) UCL	20751	99% Chebyshev(Mean, Sd) UCL	22496

Suggested UCL to Use

95% Student's-t UCL	18595	or 95% Modified-t UCL	18603

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Antimony

General Statistics

Total Number of Observations	71	Number of Distinct Observations	50
		Number of Missing Observations	5
Number of Detects	27	Number of Non-Detects	44
Number of Distinct Detects	25	Number of Distinct Non-Detects	26
Minimum Detect	0.14	Minimum Non-Detect	0.11
Maximum Detect	5.1	Maximum Non-Detect	13.4
Variance Detects	1.287	Percent Non-Detects	61.97%
Mean Detects	0.974	SD Detects	1.134
Median Detects	0.62	CV Detects	1.164
Skewness Detects	2.386	Kurtosis Detects	6.183
Mean of Logged Detects	-0.488	SD of Logged Detects	0.937

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.693	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.527	Standard Error of Mean	0.117
SD	0.869	95% KM (BCA) UCL	0.738
95% KM (t) UCL	0.721	95% KM (Percentile Bootstrap) UCL	0.745
95% KM (z) UCL	0.718	95% KM Bootstrap t UCL	0.821
90% KM Chebyshev UCL	0.876	95% KM Chebyshev UCL	1.035
97.5% KM Chebyshev UCL	1.255	99% KM Chebyshev UCL	1.687

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.987	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.192	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.172	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.222	k star (bias corrected MLE)	1.111
Theta hat (MLE)	0.798	Theta star (bias corrected MLE)	0.877
nu hat (MLE)	65.97	nu star (bias corrected)	59.98
MLE Mean (bias corrected)	0.974	MLE Sd (bias corrected)	0.925

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.367	nu hat (KM)	52.09
Approximate Chi Square Value (52.09, α)	36.51	Adjusted Chi Square Value (52.09, β)	36.24
95% Gamma Approximate KM-UCL (use when n>=50)	0.751	% Gamma Adjusted KM-UCL (use when n<50)	0.757

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.385
Maximum	5.1	Median	0.01
SD	0.835	CV	2.169
k hat (MLE)	0.34	k star (bias corrected MLE)	0.335
Theta hat (MLE)	1.133	Theta star (bias corrected MLE)	1.149
nu hat (MLE)	48.24	nu star (bias corrected)	47.53
MLE Mean (bias corrected)	0.385	MLE Sd (bias corrected)	0.665
		Adjusted Level of Significance (β)	0.0466
Approximate Chi Square Value (47.53, α)	32.71	Adjusted Chi Square Value (47.53, β)	32.46
95% Gamma Approximate UCL (use when n>=50)	0.559	95% Gamma Adjusted UCL (use when n<50)	0.563

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.441	Mean in Log Scale	-1.676
SD in Original Scale	0.812	SD in Log Scale	1.234
95% t UCL (assumes normality of ROS data)	0.601	95% Percentile Bootstrap UCL	0.603
95% BCA Bootstrap UCL	0.647	95% Bootstrap t UCL	0.684
95% H-UCL (Log ROS)	0.579		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.337	95% H-UCL (KM -Log)	0.599
KM SD (logged)	1.039	95% Critical H Value (KM-Log)	2.289
KM Standard Error of Mean (logged)	0.143		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.363	Mean in Log Scale	-0.855
SD in Original Scale	1.98	SD in Log Scale	1.576
95% t UCL (Assumes normality)	1.754	95% H-Stat UCL	2.534

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.721	95% KM (% Bootstrap) UCL	0.745

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Arsenic

General Statistics

Total Number of Observations	71	Number of Distinct Observations	34
		Number of Missing Observations	5
Minimum	3.3	Mean	5.876
Maximum	16.1	Median	5.2
SD	2.107	Std. Error of Mean	0.25
Coefficient of Variation	0.359	Skewness	2.787

Normal GOF Test

Shapiro Wilk Test Statistic	0.71	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.293	95% Adjusted-CLT UCL (Chen-1995)	6.376
		95% Modified-t UCL (Johnson-1978)	6.307

Gamma GOF Test

A-D Test Statistic	4.2	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.211	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.106	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	11.45	k star (bias corrected MLE)	10.98
Theta hat (MLE)	0.513	Theta star (bias corrected MLE)	0.535
nu hat (MLE)	1626	nu star (bias corrected)	1559
MLE Mean (bias corrected)	5.876	MLE Sd (bias corrected)	1.774
		Approximate Chi Square Value (0.05)	1468
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	1466

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6.239	95% Adjusted Gamma UCL (use when n<50)	6.247

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.867	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.8713E-8	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.193	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.194	Mean of logged Data	1.727
Maximum of Logged Data	2.779	SD of logged Data	0.278

Assuming Lognormal Distribution

95% H-UCL	6.189	90% Chebyshev (MVUE) UCL	6.426
95% Chebyshev (MVUE) UCL	6.692	97.5% Chebyshev (MVUE) UCL	7.061
99% Chebyshev (MVUE) UCL	7.786		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	6.287	95% Jackknife UCL	6.293
95% Standard Bootstrap UCL	6.279	95% Bootstrap-t UCL	6.437
95% Hall's Bootstrap UCL	6.448	95% Percentile Bootstrap UCL	6.311
95% BCA Bootstrap UCL	6.404		
90% Chebyshev(Mean, Sd) UCL	6.626	95% Chebyshev(Mean, Sd) UCL	6.966
97.5% Chebyshev(Mean, Sd) UCL	7.437	99% Chebyshev(Mean, Sd) UCL	8.364

Suggested UCL to Use

95% Student's-t UCL	6.293	or 95% Modified-t UCL	6.307

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Cadmium

General Statistics

Total Number of Observations	69	Number of Distinct Observations	54
		Number of Missing Observations	7
Number of Detects	65	Number of Non-Detects	4
Number of Distinct Detects	51	Number of Distinct Non-Detects	4
Minimum Detect	0.04	Minimum Non-Detect	0.01
Maximum Detect	1100	Maximum Non-Detect	1.1
Variance Detects	18382	Percent Non-Detects	5.797%
Mean Detects	24.24	SD Detects	135.6
Median Detects	7.5	CV Detects	5.593
Skewness Detects	8.051	Kurtosis Detects	64.87
Mean of Logged Detects	1.878	SD of Logged Detects	1.074

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.144	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.481	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.11	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	22.85	Standard Error of Mean	15.86
SD	130.7	95% KM (BCA) UCL	54.57
95% KM (t) UCL	49.29	95% KM (Percentile Bootstrap) UCL	54.35
95% KM (z) UCL	48.93	95% KM Bootstrap t UCL	644.2
90% KM Chebyshev UCL	70.42	95% KM Chebyshev UCL	91.96
97.5% KM Chebyshev UCL	121.9	99% KM Chebyshev UCL	180.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	14.51	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.819	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.411	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.117	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.487	k star (bias corrected MLE)	0.475
Theta hat (MLE)	49.78	Theta star (bias corrected MLE)	51.06
nu hat (MLE)	63.3	nu star (bias corrected)	61.72
MLE Mean (bias corrected)	24.24	MLE Sd (bias corrected)	35.18

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0306	nu hat (KM)	4.217
Approximate Chi Square Value (4.22, α)	0.809	Adjusted Chi Square Value (4.22, β)	0.779
95% Gamma Approximate KM-UCL (use when n>=50)	119	% Gamma Adjusted KM-UCL (use when n<50)	123.6

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	22.84
Maximum	1100	Median	7.4
SD	131.7	CV	5.765
k hat (MLE)	0.404	k star (bias corrected MLE)	0.396
Theta hat (MLE)	56.52	Theta star (bias corrected MLE)	57.65
nu hat (MLE)	55.76	nu star (bias corrected)	54.67
MLE Mean (bias corrected)	22.84	MLE Sd (bias corrected)	36.28
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (54.67, α)	38.68	Adjusted Chi Square Value (54.67, β)	38.39
95% Gamma Approximate UCL (use when n>=50)	32.28	95% Gamma Adjusted UCL (use when n<50)	32.52

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.11	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	22.9	Mean in Log Scale	1.771
SD in Original Scale	131.6	SD in Log Scale	1.131
95% t UCL (assumes normality of ROS data)	49.32	95% Percentile Bootstrap UCL	54.45
95% BCA Bootstrap UCL	71.03	95% Bootstrap t UCL	647.2
95% H-UCL (Log ROS)	15.1		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	22.86	Mean in Log Scale	1.662
SD in Original Scale	131.7	SD in Log Scale	1.446
95% t UCL (Assumes normality)	49.29	95% H-Stat UCL	22.24

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	91.96

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Chromium

General Statistics

Total Number of Observations	71	Number of Distinct Observations	62
		Number of Missing Observations	5
Minimum	10.6	Mean	34.11
Maximum	446	Median	27.9
SD	49.89	Std. Error of Mean	5.921
Coefficient of Variation	1.462	Skewness	8.267

Normal GOF Test

Shapiro Wilk Test Statistic	0.197	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.419	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	43.98	95% Adjusted-CLT UCL (Chen-1995)	50.06
		95% Modified-t UCL (Johnson-1978)	44.95

Gamma GOF Test

A-D Test Statistic	12.8	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.757	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.327	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.106	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.077	k star (bias corrected MLE)	2.957
Theta hat (MLE)	11.09	Theta star (bias corrected MLE)	11.54
nu hat (MLE)	437	nu star (bias corrected)	419.8
MLE Mean (bias corrected)	34.11	MLE Sd (bias corrected)	19.84
		Approximate Chi Square Value (0.05)	373.3
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	372.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	38.36	95% Adjusted Gamma UCL (use when n<50)	38.45

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.602	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.24	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.361	Mean of logged Data	3.358
Maximum of Logged Data	6.1	SD of logged Data	0.393

Assuming Lognormal Distribution

95% H-UCL	33.78	90% Chebyshev (MVUE) UCL	35.51
95% Chebyshev (MVUE) UCL	37.54	97.5% Chebyshev (MVUE) UCL	40.36
99% Chebyshev (MVUE) UCL	45.9		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	43.85	95% Jackknife UCL	43.98
95% Standard Bootstrap UCL	43.38	95% Bootstrap-t UCL	100.4
95% Hall's Bootstrap UCL	92.98	95% Percentile Bootstrap UCL	45.72
95% BCA Bootstrap UCL	52.53		
90% Chebyshev(Mean, Sd) UCL	51.87	95% Chebyshev(Mean, Sd) UCL	59.92
97.5% Chebyshev(Mean, Sd) UCL	71.09	99% Chebyshev(Mean, Sd) UCL	93.02

Suggested UCL to Use

95% Student's-t UCL	43.98	or 95% Modified-t UCL	44.95

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Cobalt

General Statistics

Total Number of Observations	71	Number of Distinct Observations	40
		Number of Missing Observations	5
Minimum	6.4	Mean	11.99
Maximum	19.7	Median	12.1
SD	1.842	Std. Error of Mean	0.219
Coefficient of Variation	0.154	Skewness	0.794

Normal GOF Test

Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.00229	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.36	95% Adjusted-CLT UCL (Chen-1995)	12.38
		95% Modified-t UCL (Johnson-1978)	12.36

Gamma GOF Test

A-D Test Statistic	1.282	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.104	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.105	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	43.41	k star (bias corrected MLE)	41.58
Theta hat (MLE)	0.276	Theta star (bias corrected MLE)	0.288
nu hat (MLE)	6164	nu star (bias corrected)	5905
MLE Mean (bias corrected)	11.99	MLE Sd (bias corrected)	1.86
		Approximate Chi Square Value (0.05)	5727
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	5724

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	12.37	95% Adjusted Gamma UCL (use when n<50)	12.37

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0105	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.103	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.856	Mean of logged Data	2.473
Maximum of Logged Data	2.981	SD of logged Data	0.154

Assuming Lognormal Distribution

95% H-UCL	12.38	90% Chebyshev (MVUE) UCL	12.66
95% Chebyshev (MVUE) UCL	12.96	97.5% Chebyshev (MVUE) UCL	13.38
99% Chebyshev (MVUE) UCL	14.2		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	12.35	95% Jackknife UCL	12.36
95% Standard Bootstrap UCL	12.36	95% Bootstrap-t UCL	12.4
95% Hall's Bootstrap UCL	12.42	95% Percentile Bootstrap UCL	12.35
95% BCA Bootstrap UCL	12.37		
90% Chebyshev(Mean, Sd) UCL	12.65	95% Chebyshev(Mean, Sd) UCL	12.95
97.5% Chebyshev(Mean, Sd) UCL	13.36	99% Chebyshev(Mean, Sd) UCL	14.17

Suggested UCL to Use

95% Approximate Gamma UCL	12.37

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Copper

General Statistics

Total Number of Observations	71	Number of Distinct Observations	70
		Number of Missing Observations	5
Minimum	24.7	Mean	598.5
Maximum	7310	Median	411
SD	997.4	Std. Error of Mean	118.4
Coefficient of Variation	1.667	Skewness	5.254

Normal GOF Test

Shapiro Wilk Test Statistic	0.446	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	795.8	95% Adjusted-CLT UCL (Chen-1995)	872
		95% Modified-t UCL (Johnson-1978)	808.1

Gamma GOF Test

A-D Test Statistic	2.946	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.779	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.188	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.109	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.08	k star (bias corrected MLE)	1.043
Theta hat (MLE)	554.3	Theta star (bias corrected MLE)	573.5
nu hat (MLE)	153.3	nu star (bias corrected)	148.2
MLE Mean (bias corrected)	598.5	MLE Sd (bias corrected)	585.9
		Approximate Chi Square Value (0.05)	121
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	120.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	732.6	95% Adjusted Gamma UCL (use when n<50)	735.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0057	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.112	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.207	Mean of logged Data	5.864
Maximum of Logged Data	8.897	SD of logged Data	0.998

Assuming Lognormal Distribution

95% H-UCL	758	90% Chebyshev (MVUE) UCL	816
95% Chebyshev (MVUE) UCL	925.8	97.5% Chebyshev (MVUE) UCL	1078
99% Chebyshev (MVUE) UCL	1377		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	793.1	95% Jackknife UCL	795.8
95% Standard Bootstrap UCL	792.1	95% Bootstrap-t UCL	1064
95% Hall's Bootstrap UCL	1614	95% Percentile Bootstrap UCL	806.5
95% BCA Bootstrap UCL	874.1		
90% Chebyshev(Mean, Sd) UCL	953.6	95% Chebyshev(Mean, Sd) UCL	1114
97.5% Chebyshev(Mean, Sd) UCL	1338	99% Chebyshev(Mean, Sd) UCL	1776

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	1114

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lead

General Statistics

Total Number of Observations	71	Number of Distinct Observations	68
		Number of Missing Observations	5
Minimum	11.2	Mean	76.78
Maximum	998	Median	59.3
SD	119.7	Std. Error of Mean	14.21
Coefficient of Variation	1.559	Skewness	6.883

Normal GOF Test

Shapiro Wilk Test Statistic	0.328	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.382	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	100.5	95% Adjusted-CLT UCL (Chen-1995)	112.6
		95% Modified-t UCL (Johnson-1978)	102.4

Gamma GOF Test

A-D Test Statistic	6.689	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.765	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.262	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.107	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.854	k star (bias corrected MLE)	1.785
Theta hat (MLE)	41.41	Theta star (bias corrected MLE)	43
nu hat (MLE)	263.3	nu star (bias corrected)	253.5
MLE Mean (bias corrected)	76.78	MLE Sd (bias corrected)	57.46
		Approximate Chi Square Value (0.05)	217.7
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	217

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	89.43	95% Adjusted Gamma UCL (use when n<50)	89.71

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	8.3297E-9	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.416	Mean of logged Data	4.048
Maximum of Logged Data	6.906	SD of logged Data	0.625

Assuming Lognormal Distribution

95% H-UCL	80.4	90% Chebyshev (MVUE) UCL	86.05
95% Chebyshev (MVUE) UCL	93.6	97.5% Chebyshev (MVUE) UCL	104.1
99% Chebyshev (MVUE) UCL	124.7		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	100.2	95% Jackknife UCL	100.5
95% Standard Bootstrap UCL	100.5	95% Bootstrap-t UCL	164.3
95% Hall's Bootstrap UCL	189.1	95% Percentile Bootstrap UCL	103.1
95% BCA Bootstrap UCL	121.5		
90% Chebyshev(Mean, Sd) UCL	119.4	95% Chebyshev(Mean, Sd) UCL	138.7
97.5% Chebyshev(Mean, Sd) UCL	165.5	99% Chebyshev(Mean, Sd) UCL	218.2

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	138.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Manganese

General Statistics

Total Number of Observations	71	Number of Distinct Observations	63
		Number of Missing Observations	5
Minimum	361	Mean	604.5
Maximum	1380	Median	583
SD	164.2	Std. Error of Mean	19.48
Coefficient of Variation	0.272	Skewness	2.066

Normal GOF Test

Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	1.735E-10	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	637	95% Adjusted-CLT UCL (Chen-1995)	641.6
		95% Modified-t UCL (Johnson-1978)	637.8

Gamma GOF Test

A-D Test Statistic	1.664	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.106	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	16.55	k star (bias corrected MLE)	15.86
Theta hat (MLE)	36.52	Theta star (bias corrected MLE)	38.1
nu hat (MLE)	2351	nu star (bias corrected)	2253
MLE Mean (bias corrected)	604.5	MLE Sd (bias corrected)	151.8
		Approximate Chi Square Value (0.05)	2143
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	2141

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	635.3	95% Adjusted Gamma UCL (use when n<50)	636

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00357	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.889	Mean of logged Data	6.374
Maximum of Logged Data	7.23	SD of logged Data	0.242

Assuming Lognormal Distribution

95% H-UCL	634.5	90% Chebyshev (MVUE) UCL	656.1
95% Chebyshev (MVUE) UCL	679.9	97.5% Chebyshev (MVUE) UCL	713
99% Chebyshev (MVUE) UCL	778		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	636.5	95% Jackknife UCL	637
95% Standard Bootstrap UCL	636.7	95% Bootstrap-t UCL	642.9
95% Hall's Bootstrap UCL	651.9	95% Percentile Bootstrap UCL	638.5
95% BCA Bootstrap UCL	642.4		
90% Chebyshev(Mean, Sd) UCL	662.9	95% Chebyshev(Mean, Sd) UCL	689.4
97.5% Chebyshev(Mean, Sd) UCL	726.2	99% Chebyshev(Mean, Sd) UCL	798.3

Suggested UCL to Use

95% Student's-t UCL	637	or 95% Modified-t UCL	637.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Silver

General Statistics

Total Number of Observations	71	Number of Distinct Observations	46
		Number of Missing Observations	5
Number of Detects	59	Number of Non-Detects	12
Number of Distinct Detects	38	Number of Distinct Non-Detects	9
Minimum Detect	0.12	Minimum Non-Detect	0.04
Maximum Detect	205	Maximum Non-Detect	3
Variance Detects	737.7	Percent Non-Detects	16.9%
Mean Detects	7.703	SD Detects	27.16
Median Detects	3.4	CV Detects	3.526
Skewness Detects	6.926	Kurtosis Detects	50.24
Mean of Logged Detects	0.969	SD of Logged Detects	1.239

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.239	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.438	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.115	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	6.49	Standard Error of Mean	2.956
SD	24.7	95% KM (BCA) UCL	12.28
95% KM (t) UCL	11.42	95% KM (Percentile Bootstrap) UCL	11.99
95% KM (z) UCL	11.35	95% KM Bootstrap t UCL	46.6
90% KM Chebyshev UCL	15.36	95% KM Chebyshev UCL	19.38
97.5% KM Chebyshev UCL	24.95	99% KM Chebyshev UCL	35.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	7.035	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.323	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.122	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.579	k star (bias corrected MLE)	0.561
Theta hat (MLE)	13.3	Theta star (bias corrected MLE)	13.73
nu hat (MLE)	68.32	nu star (bias corrected)	66.18
MLE Mean (bias corrected)	7.703	MLE Sd (bias corrected)	10.29

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0691	nu hat (KM)	9.806
Approximate Chi Square Value (9.81, α)	3.821	Adjusted Chi Square Value (9.81, β)	3.743
95% Gamma Approximate KM-UCL (use when n>=50)	16.66	% Gamma Adjusted KM-UCL (use when n<50)	17

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6.403
Maximum	205	Median	3
SD	24.89	CV	3.888
k hat (MLE)	0.365	k star (bias corrected MLE)	0.359
Theta hat (MLE)	17.54	Theta star (bias corrected MLE)	17.84
nu hat (MLE)	51.82	nu star (bias corrected)	50.97
MLE Mean (bias corrected)	6.403	MLE Sd (bias corrected)	10.69
		Adjusted Level of Significance (β)	0.0466
Approximate Chi Square Value (50.97, α)	35.57	Adjusted Chi Square Value (50.97, β)	35.31
95% Gamma Approximate UCL (use when n>=50)	9.174	95% Gamma Adjusted UCL (use when n<50)	9.243

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.115	Detected Data Not Lognormal at 5% Significance Level	

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	6.487	Mean in Log Scale	0.664
SD in Original Scale	24.87	SD in Log Scale	1.341
95% t UCL (assumes normality of ROS data)	11.41	95% Percentile Bootstrap UCL	11.96
95% BCA Bootstrap UCL	15.5	95% Bootstrap t UCL	35.91
95% H-UCL (Log ROS)	7.252		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.529	Mean in Log Scale	0.676
SD in Original Scale	24.86	SD in Log Scale	1.42
95% t UCL (Assumes normality)	11.45	95% H-Stat UCL	8.525

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 19.38

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Thallium

General Statistics

Total Number of Observations	71	Number of Distinct Observations	28
		Number of Missing Observations	5
Number of Detects	6	Number of Non-Detects	65
Number of Distinct Detects	6	Number of Distinct Non-Detects	26
Minimum Detect	0.1	Minimum Non-Detect	0.08
Maximum Detect	0.27	Maximum Non-Detect	0.44
Variance Detects	0.00416	Percent Non-Detects	91.55%
Mean Detects	0.2	SD Detects	0.0645
Median Detects	0.215	CV Detects	0.322
Skewness Detects	-0.704	Kurtosis Detects	-0.695
Mean of Logged Detects	-1.662	SD of Logged Detects	0.376

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0978	Standard Error of Mean	0.00752
SD	0.0439	95% KM (BCA) UCL	0.117
95% KM (t) UCL	0.11	95% KM (Percentile Bootstrap) UCL	0.114
95% KM (z) UCL	0.11	95% KM Bootstrap t UCL	0.105
90% KM Chebyshev UCL	0.12	95% KM Chebyshev UCL	0.131
97.5% KM Chebyshev UCL	0.145	99% KM Chebyshev UCL	0.173

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.343	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.21	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	9.603	k star (bias corrected MLE)	4.913
Theta hat (MLE)	0.0208	Theta star (bias corrected MLE)	0.0407
nu hat (MLE)	115.2	nu star (bias corrected)	58.95
MLE Mean (bias corrected)	0.2	MLE Sd (bias corrected)	0.0902

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	4.951	nu hat (KM)	703
Approximate Chi Square Value (703.00, α)	642.5	Adjusted Chi Square Value (703.00, β)	641.3
95% Gamma Approximate KM-UCL (use when n>=50)	0.107	% Gamma Adjusted KM-UCL (use when n<50)	0.107

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0505
Maximum	0.27	Median	0.0326
SD	0.0574	CV	1.136
k hat (MLE)	1.112	k star (bias corrected MLE)	1.074
Theta hat (MLE)	0.0454	Theta star (bias corrected MLE)	0.047
nu hat (MLE)	157.9	nu star (bias corrected)	152.5
MLE Mean (bias corrected)	0.0505	MLE Sd (bias corrected)	0.0487
		Adjusted Level of Significance (β)	0.0466
Approximate Chi Square Value (152.54, α)	125	Adjusted Chi Square Value (152.54, β)	124.5
95% Gamma Approximate UCL (use when n>=50)	0.0616	95% Gamma Adjusted UCL (use when n<50)	0.0619

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0738	Mean in Log Scale	-2.743
SD in Original Scale	0.0473	SD in Log Scale	0.49
95% t UCL (assumes normality of ROS data)	0.0831	95% Percentile Bootstrap UCL	0.0833
95% BCA Bootstrap UCL	0.0854	95% Bootstrap t UCL	0.0854
95% H-UCL (Log ROS)	0.0809		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.387	95% H-UCL (KM -Log)	0.103
KM SD (logged)	0.313	95% Critical H Value (KM-Log)	1.751
KM Standard Error of Mean (logged)	0.058		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.112	Mean in Log Scale	-2.284
SD in Original Scale	0.0507	SD in Log Scale	0.446
95% t UCL (Assumes normality)	0.122	95% H-Stat UCL	0.124

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.11	95% KM (Percentile Bootstrap) UCL	0.114

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Vanadium

General Statistics

Total Number of Observations	71	Number of Distinct Observations	58
		Number of Missing Observations	5
Minimum	16.6	Mean	28.67
Maximum	53.7	Median	28.5
SD	5.431	Std. Error of Mean	0.645
Coefficient of Variation	0.189	Skewness	1.226

Normal GOF Test

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	6.2469E-5	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	29.75	95% Adjusted-CLT UCL (Chen-1995)	29.83
		95% Modified-t UCL (Johnson-1978)	29.76

Gamma GOF Test

A-D Test Statistic	1.437	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.135	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	29.74	k star (bias corrected MLE)	28.49
Theta hat (MLE)	0.964	Theta star (bias corrected MLE)	1.006
nu hat (MLE)	4223	nu star (bias corrected)	4046
MLE Mean (bias corrected)	28.67	MLE Sd (bias corrected)	5.371
		Approximate Chi Square Value (0.05)	3899
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	3896

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	29.75	95% Adjusted Gamma UCL (use when n<50)	29.78

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0189	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.146	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.809	Mean of logged Data	3.339
Maximum of Logged Data	3.983	SD of logged Data	0.185

Assuming Lognormal Distribution

95% H-UCL	29.78	90% Chebyshev (MVUE) UCL	30.58
95% Chebyshev (MVUE) UCL	31.44	97.5% Chebyshev (MVUE) UCL	32.64
99% Chebyshev (MVUE) UCL	34.99		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	29.73	95% Jackknife UCL	29.75
95% Standard Bootstrap UCL	29.71	95% Bootstrap-t UCL	29.83
95% Hall's Bootstrap UCL	30	95% Percentile Bootstrap UCL	29.75
95% BCA Bootstrap UCL	29.83		
90% Chebyshev(Mean, Sd) UCL	30.61	95% Chebyshev(Mean, Sd) UCL	31.48
97.5% Chebyshev(Mean, Sd) UCL	32.7	99% Chebyshev(Mean, Sd) UCL	35.09

Suggested UCL to Use

95% Student's-t UCL	29.75	or 95% Modified-t UCL	29.76

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.4

OD Hill Area Total Soil UCL calculations, continued

Mercury

General Statistics

Total Number of Observations	71	Number of Distinct Observations	46
		Number of Missing Observations	5
Minimum	0.02	Mean	3.548
Maximum	9.1	Median	3.5
SD	2.096	Std. Error of Mean	0.249
Coefficient of Variation	0.591	Skewness	0.489

Normal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0276	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3.962	95% Adjusted-CLT UCL (Chen-1995)	3.972
		95% Modified-t UCL (Johnson-1978)	3.965

Gamma GOF Test

A-D Test Statistic	2.816	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.187	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.108	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.602	k star (bias corrected MLE)	1.544
Theta hat (MLE)	2.214	Theta star (bias corrected MLE)	2.298
nu hat (MLE)	227.5	nu star (bias corrected)	219.2
MLE Mean (bias corrected)	3.548	MLE Sd (bias corrected)	2.855
		Approximate Chi Square Value (0.05)	186
Adjusted Level of Significance	0.0466	Adjusted Chi Square Value	185.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	4.182	95% Adjusted Gamma UCL (use when n<50)	4.196

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.754	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	3.331E-16	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.226	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.105	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.912	Mean of logged Data	0.923
Maximum of Logged Data	2.208	SD of logged Data	1.141

Assuming Lognormal Distribution

95% H-UCL	6.688	90% Chebyshev (MVUE) UCL	7.144
95% Chebyshev (MVUE) UCL	8.226	97.5% Chebyshev (MVUE) UCL	9.728
99% Chebyshev (MVUE) UCL	12.68		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	3.957	95% Jackknife UCL	3.962
95% Standard Bootstrap UCL	3.953	95% Bootstrap-t UCL	3.956
95% Hall's Bootstrap UCL	3.991	95% Percentile Bootstrap UCL	3.938
95% BCA Bootstrap UCL	3.952		
90% Chebyshev(Mean, Sd) UCL	4.294	95% Chebyshev(Mean, Sd) UCL	4.632
97.5% Chebyshev(Mean, Sd) UCL	5.101	99% Chebyshev(Mean, Sd) UCL	6.022

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	4.632

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.5

Kickout Area Summary Statistics

	General Statistics on Uncensored Data
Date/Time of Computation	###########
User Selected Options	
From File	ProUCL_Kickout Soil_rev2.xls
Full Precision	OFF

From File: ProUCL_Kickout Soil_rev2.xls

General Statistics for Censored Data Set (with NDs) using Kaplan Meier Method

Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
Phenanthrene	7	18	1	6	85.71%	0.099	0.42	0.018	0	0	N/A
MCPA	7	18	2	5	71.43%	2.7	6.3	4.171	6.099	2.47	0.592
Aluminum	23	2	23	0	0.00%	N/A	N/A	18935	4983281	2232	0.118
Arsenic	23	2	23	0	0.00%	N/A	N/A	5.278	0.726	0.852	0.161
Cadmium	23	2	11	12	52.17%	0.94	4.1	1.832	4.247	2.061	1.125
Chromium	23	2	23	0	0.00%	N/A	N/A	27.22	12.81	3.579	0.131
Cobalt	23	2	23	0	0.00%	N/A	N/A	12.47	21.37	4.623	0.371
Manganese	23	2	23	0	0.00%	N/A	N/A	803.1	909968	953.9	1.188
Vanadium	23	2	23	0	0.00%	N/A	N/A	31.1	20.3	4.506	0.145

General Statistics for Raw Data Sets using Detected Data Only

Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
Phenanthrene	1	18	0.018	0.018	0.018	0.018	N/A	N/A	0	N/A	N/A
MCPA	2	18	6.3	9.4	7.85	7.85	4.805	2.192	2.298	N/A	0.279
Aluminum	23	2	14200	25000	18935	18800	4983281	2232	1631	0.564	0.118
Arsenic	23	2	3.9	7.6	5.278	5.1	0.726	0.852	0.445	1.115	0.161
Cadmium	11	2	0.46	8.3	3.08	2.4	6.349	2.52	2.639	0.899	0.818
Chromium	23	2	22.4	39.3	27.22	27.2	12.81	3.579	2.965	1.723	0.131
Cobalt	23	2	7.7	26.8	12.47	10.9	21.37	4.623	1.927	2.193	0.371
Manganese	23	2	256	5040	803.1	562	909968	953.9	198.7	4.326	1.188
Vanadium	23	2	22.5	41.9	31.1	30.7	20.3	4.506	3.855	0.33	0.145

Percentiles using all Detects (Ds) and Non-Detects (NDs)

Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
Phenanthrene	7	18	0.0666	0.0992	0.0995	0.38	0.405	0.408	0.414	0.417	0.419
MCPA	7	18	2.88	3.58	4.45	6	6.3	6.3	7.54	8.47	9.214
Aluminum	23	2	16600	17340	17600	18800	19900	20380	21420	22050	24362
Arsenic	23	2	4.52	4.8	4.85	5.1	5.45	5.62	6.34	6.94	7.468
Cadmium	23	2	0.944	0.988	1.05	1.4	2.7	3.58	5.04	5.46	7.684
Chromium	23	2	23.94	24.14	24.4	27.2	28.6	29.04	30.56	31.34	37.56
Cobalt	23	2	9.12	9.72	9.95	10.9	12.7	13.62	16.12	23.51	26.25
Manganese	23	2	393.4	431.6	441.5	562	761	862	1064	1143	4184
Vanadium	23	2	25.38	27.7	28.75	30.7	33.45	33.72	36.92	37.75	41

Table A.2.6

Kickout Area UCL Calculations

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	9/30/2014 10:12:56 AM
From File	ProUCL_Kickout Soil_rev2.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	2
Minimum	14200	Mean	18935
Maximum	25000	Median	18800
SD	2232	Std. Error of Mean	465.5
Coefficient of Variation	0.118	Skewness	0.564

Normal GOF Test

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19734	95% Adjusted-CLT UCL (Chen-1995)	19759
		95% Modified-t UCL (Johnson-1978)	19743

Gamma GOF Test

A-D Test Statistic	0.291	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.107	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.181	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	76.52	k star (bias corrected MLE)	66.57
Theta hat (MLE)	247.4	Theta star (bias corrected MLE)	284.4
nu hat (MLE)	3520	nu star (bias corrected)	3062
MLE Mean (bias corrected)	18935	MLE Sd (bias corrected)	2321
		Approximate Chi Square Value (0.05)	2935
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	2926

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19758	95% Adjusted Gamma UCL (use when n<50)	19819

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.114	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	9.561	Mean of logged Data	9.842
Maximum of Logged Data	10.13	SD of logged Data	0.117

Assuming Lognormal Distribution

95% H-UCL	19771	90% Chebyshev (MVUE) UCL	20322
95% Chebyshev (MVUE) UCL	20950	97.5% Chebyshev (MVUE) UCL	21823
99% Chebyshev (MVUE) UCL	23536		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	19700	95% Jackknife UCL	19734
95% Standard Bootstrap UCL	19691	95% Bootstrap-t UCL	19814
95% Hall's Bootstrap UCL	19928	95% Percentile Bootstrap UCL	19726
95% BCA Bootstrap UCL	19761		
90% Chebyshev(Mean, Sd) UCL	20331	95% Chebyshev(Mean, Sd) UCL	20964
97.5% Chebyshev(Mean, Sd) UCL	21842	99% Chebyshev(Mean, Sd) UCL	23566

Suggested UCL to Use

95% Student's-t UCL	19734

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.6

Kickout Area UCL Calculations, continued

Arsenic

General Statistics

Total Number of Observations	23	Number of Distinct Observations	17
		Number of Missing Observations	2
Minimum	3.9	Mean	5.278
Maximum	7.6	Median	5.1
SD	0.852	Std. Error of Mean	0.178
Coefficient of Variation	0.161	Skewness	1.115

Normal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.189	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.583	95% Adjusted-CLT UCL (Chen-1995)	5.615
		95% Modified-t UCL (Johnson-1978)	5.59

Gamma GOF Test

A-D Test Statistic	0.784	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.742	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.171	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.181	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	43.09	k star (bias corrected MLE)	37.5
Theta hat (MLE)	0.122	Theta star (bias corrected MLE)	0.141
nu hat (MLE)	1982	nu star (bias corrected)	1725
MLE Mean (bias corrected)	5.278	MLE Sd (bias corrected)	0.862
		Approximate Chi Square Value (0.05)	1629
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	1623

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	5.587	95% Adjusted Gamma UCL (use when n<50)	5.611

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.361	Mean of logged Data	1.652
Maximum of Logged Data	2.028	SD of logged Data	0.154

Assuming Lognormal Distribution

95% H-UCL	5.59	90% Chebyshev (MVUE) UCL	5.787
95% Chebyshev (MVUE) UCL	6.018	97.5% Chebyshev (MVUE) UCL	6.339
99% Chebyshev (MVUE) UCL	6.969		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	5.571	95% Jackknife UCL	5.583
95% Standard Bootstrap UCL	5.562	95% Bootstrap-t UCL	5.677
95% Hall's Bootstrap UCL	5.686	95% Percentile Bootstrap UCL	5.578
95% BCA Bootstrap UCL	5.609		
90% Chebyshev(Mean, Sd) UCL	5.811	95% Chebyshev(Mean, Sd) UCL	6.053
97.5% Chebyshev(Mean, Sd) UCL	6.388	99% Chebyshev(Mean, Sd) UCL	7.046

Suggested UCL to Use

95% Adjusted Gamma UCL	5.611

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.6

Kickout Area UCL Calculations, continued

Cadmium

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	2
Number of Detects	11	Number of Non-Detects	12
Number of Distinct Detects	11	Number of Distinct Non-Detects	9
Minimum Detect	0.46	Minimum Non-Detect	0.94
Maximum Detect	8.3	Maximum Non-Detect	4.1
Variance Detects	6.349	Percent Non-Detects	52.17%
Mean Detects	3.08	SD Detects	2.52
Median Detects	2.4	CV Detects	0.818
Skewness Detects	0.899	Kurtosis Detects	0.0314
Mean of Logged Detects	0.759	SD of Logged Detects	0.958

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1.832	Standard Error of Mean	0.455
SD	2.061	95% KM (BCA) UCL	2.644
95% KM (t) UCL	2.614	95% KM (Percentile Bootstrap) UCL	2.592
95% KM (z) UCL	2.581	95% KM Bootstrap t UCL	3.012
90% KM Chebyshev UCL	3.198	95% KM Chebyshev UCL	3.817
97.5% KM Chebyshev UCL	4.676	99% KM Chebyshev UCL	6.364

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.268	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.167	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.26	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.513	k star (bias corrected MLE)	1.161
Theta hat (MLE)	2.036	Theta star (bias corrected MLE)	2.654
nu hat (MLE)	33.28	nu star (bias corrected)	25.54
MLE Mean (bias corrected)	3.08	MLE Sd (bias corrected)	2.859

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.79	nu hat (KM)	36.35
Approximate Chi Square Value (36.35, α)	23.55	Adjusted Chi Square Value (36.35, β)	22.8
95% Gamma Approximate KM-UCL (use when n>=50)	2.827	% Gamma Adjusted KM-UCL (use when n<50)	2.92

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.627
Maximum	8.3	Median	0.62
SD	2.229	CV	1.37
k hat (MLE)	0.462	k star (bias corrected MLE)	0.43
Theta hat (MLE)	3.525	Theta star (bias corrected MLE)	3.78
nu hat (MLE)	21.24	nu star (bias corrected)	19.8
MLE Mean (bias corrected)	1.627	MLE Sd (bias corrected)	2.48
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (19.80, α)	10.71	Adjusted Chi Square Value (19.80, β)	10.22
95% Gamma Approximate UCL (use when n>=50)	3.01	95% Gamma Adjusted UCL (use when n<50)	3.153

Table A.2.6

Kickout Area UCL Calculations, continued

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.82	Mean in Log Scale	0.124
SD in Original Scale	2.105	SD in Log Scale	0.927
95% t UCL (assumes normality of ROS data)	2.574	95% Percentile Bootstrap UCL	2.565
95% BCA Bootstrap UCL	2.732	95% Bootstrap t UCL	2.864
95% H-UCL (Log ROS)	2.812		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.127	95% H-UCL (KM -Log)	2.757
KM SD (logged)	0.913	95% Critical H Value (KM-Log)	2.415
KM Standard Error of Mean (logged)	0.217		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.888	Mean in Log Scale	0.19
SD in Original Scale	2.086	SD in Log Scale	0.907
95% t UCL (Assumes normality)	2.635	95% H-Stat UCL	2.904

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.614	95% KM (Percentile Bootstrap) UCL	2.592

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table A.2.6

Kickout Area UCL Calculations, continued

Chromium

General Statistics

Total Number of Observations	23	Number of Distinct Observations	21
		Number of Missing Observations	2
Minimum	22.4	Mean	27.22
Maximum	39.3	Median	27.2
SD	3.579	Std. Error of Mean	0.746
Coefficient of Variation	0.131	Skewness	1.723

Normal GOF Test

Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.122	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	28.5	95% Adjusted-CLT UCL (Chen-1995)	28.73
		95% Modified-t UCL (Johnson-1978)	28.54

Gamma GOF Test

A-D Test Statistic	0.501	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.102	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.181	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	67.03	k star (bias corrected MLE)	58.32
Theta hat (MLE)	0.406	Theta star (bias corrected MLE)	0.467
nu hat (MLE)	3084	nu star (bias corrected)	2683
MLE Mean (bias corrected)	27.22	MLE Sd (bias corrected)	3.564
		Approximate Chi Square Value (0.05)	2563
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	2555

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	28.48	95% Adjusted Gamma UCL (use when n<50)	28.58

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0969	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.109	Mean of logged Data	3.296
Maximum of Logged Data	3.671	SD of logged Data	0.122

Assuming Lognormal Distribution

95% H-UCL	28.47	90% Chebyshev (MVUE) UCL	29.29
95% Chebyshev (MVUE) UCL	30.24	97.5% Chebyshev (MVUE) UCL	31.55
99% Chebyshev (MVUE) UCL	34.13		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	28.44	95% Jackknife UCL	28.5
95% Standard Bootstrap UCL	28.42	95% Bootstrap-t UCL	28.9
95% Hall's Bootstrap UCL	29.76	95% Percentile Bootstrap UCL	28.46
95% BCA Bootstrap UCL	28.82		
90% Chebyshev(Mean, Sd) UCL	29.46	95% Chebyshev(Mean, Sd) UCL	30.47
97.5% Chebyshev(Mean, Sd) UCL	31.88	99% Chebyshev(Mean, Sd) UCL	34.64

Suggested UCL to Use

95% Student's-t UCL	28.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.6

Kickout Area UCL Calculations, continued

Cobalt

General Statistics

Total Number of Observations	23	Number of Distinct Observations	20
		Number of Missing Observations	2
Minimum	7.7	Mean	12.47
Maximum	26.8	Median	10.9
SD	4.623	Std. Error of Mean	0.964
Coefficient of Variation	0.371	Skewness	2.193

Normal GOF Test

Shapiro Wilk Test Statistic	0.734	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.12	95% Adjusted-CLT UCL (Chen-1995)	14.53
		95% Modified-t UCL (Johnson-1978)	14.2

Gamma GOF Test

A-D Test Statistic	1.376	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.198	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.182	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	10.36	k star (bias corrected MLE)	9.035
Theta hat (MLE)	1.204	Theta star (bias corrected MLE)	1.38
nu hat (MLE)	476.4	nu star (bias corrected)	415.6
MLE Mean (bias corrected)	12.47	MLE Sd (bias corrected)	4.148
		Approximate Chi Square Value (0.05)	369.4
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	366.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	14.03	95% Adjusted Gamma UCL (use when n<50)	14.15

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.041	Mean of logged Data	2.474
Maximum of Logged Data	3.288	SD of logged Data	0.3

Assuming Lognormal Distribution

95% H-UCL	13.95	90% Chebyshev (MVUE) UCL	14.75
95% Chebyshev (MVUE) UCL	15.82	97.5% Chebyshev (MVUE) UCL	17.3
99% Chebyshev (MVUE) UCL	20.21		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	14.06	95% Jackknife UCL	14.12
95% Standard Bootstrap UCL	14.02	95% Bootstrap-t UCL	15.73
95% Hall's Bootstrap UCL	22.31	95% Percentile Bootstrap UCL	14.1
95% BCA Bootstrap UCL	14.59		
90% Chebyshev(Mean, Sd) UCL	15.36	95% Chebyshev(Mean, Sd) UCL	16.67
97.5% Chebyshev(Mean, Sd) UCL	18.49	99% Chebyshev(Mean, Sd) UCL	22.06

Suggested UCL to Use

95% Student's-t UCL	14.12	or 95% Modified-t UCL	14.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.6

Kickout Area UCL Calculations, continued

Manganese

General Statistics

Total Number of Observations	23	Number of Distinct Observations	21
		Number of Missing Observations	2
Minimum	256	Mean	803.1
Maximum	5040	Median	562
SD	953.9	Std. Error of Mean	198.9
Coefficient of Variation	1.188	Skewness	4.326

Normal GOF Test

Shapiro Wilk Test Statistic	0.433	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1145	95% Adjusted-CLT UCL (Chen-1995)	1322
		95% Modified-t UCL (Johnson-1978)	1175

Gamma GOF Test

A-D Test Statistic	2.006	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.203	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.184	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.137	k star (bias corrected MLE)	1.887
Theta hat (MLE)	375.9	Theta star (bias corrected MLE)	425.6
nu hat (MLE)	98.28	nu star (bias corrected)	86.8
MLE Mean (bias corrected)	803.1	MLE Sd (bias corrected)	584.6
		Approximate Chi Square Value (0.05)	66.32
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	65.02

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1051	95% Adjusted Gamma UCL (use when n<50)	1072

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.149	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.545	Mean of logged Data	6.437
Maximum of Logged Data	8.525	SD of logged Data	0.593

Assuming Lognormal Distribution

95% H-UCL	965.5	90% Chebyshev (MVUE) UCL	1026
95% Chebyshev (MVUE) UCL	1157	97.5% Chebyshev (MVUE) UCL	1338
99% Chebyshev (MVUE) UCL	1695		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1130	95% Jackknife UCL	1145
95% Standard Bootstrap UCL	1117	95% Bootstrap-t UCL	1920
95% Hall's Bootstrap UCL	2347	95% Percentile Bootstrap UCL	1182
95% BCA Bootstrap UCL	1380		
90% Chebyshev(Mean, Sd) UCL	1400	95% Chebyshev(Mean, Sd) UCL	1670
97.5% Chebyshev(Mean, Sd) UCL	2045	99% Chebyshev(Mean, Sd) UCL	2782

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	1670

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Table A.2.6

Kickout Area UCL Calculations, continued

Vanadium

General Statistics

Total Number of Observations	23	Number of Distinct Observations	23
		Number of Missing Observations	2
Minimum	22.5	Mean	31.1
Maximum	41.9	Median	30.7
SD	4.506	Std. Error of Mean	0.94
Coefficient of Variation	0.145	Skewness	0.33

Normal GOF Test

Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.101	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	32.72	95% Adjusted-CLT UCL (Chen-1995)	32.72
		95% Modified-t UCL (Johnson-1978)	32.73

Gamma GOF Test

A-D Test Statistic	0.165	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0864	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.181	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	49.95	k star (bias corrected MLE)	43.47
Theta hat (MLE)	0.623	Theta star (bias corrected MLE)	0.716
nu hat (MLE)	2298	nu star (bias corrected)	1999
MLE Mean (bias corrected)	31.1	MLE Sd (bias corrected)	4.718
		Approximate Chi Square Value (0.05)	1897
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	1889

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	32.79	95% Adjusted Gamma UCL (use when n<50)	32.92

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0884	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.185	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.114	Mean of logged Data	3.427
Maximum of Logged Data	3.735	SD of logged Data	0.145

Assuming Lognormal Distribution

95% H-UCL	32.84	90% Chebyshev (MVUE) UCL	33.94
95% Chebyshev (MVUE) UCL	35.23	97.5% Chebyshev (MVUE) UCL	37.01
99% Chebyshev (MVUE) UCL	40.52		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	32.65	95% Jackknife UCL	32.72
95% Standard Bootstrap UCL	32.62	95% Bootstrap-t UCL	32.81
95% Hall's Bootstrap UCL	32.83	95% Percentile Bootstrap UCL	32.59
95% BCA Bootstrap UCL	32.69		
90% Chebyshev(Mean, Sd) UCL	33.92	95% Chebyshev(Mean, Sd) UCL	35.2
97.5% Chebyshev(Mean, Sd) UCL	36.97	99% Chebyshev(Mean, Sd) UCL	40.45

Suggested UCL to Use

95% Student's-t UCL	32.72

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

ATTACHMENT B

Human Health Risk Characterization Supporting Documentation

Attachment B Contents

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B.5 Surface Soil Risk Characterization Calculations for Kickout Area

B.5.1 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates - Incidental Ingestion of Surface Soil (0-≤2')

B.6 Surface Water Risk Characterization Calculations

B.1 Surface Soil Risk Characterization Calculations for OD Hill Area

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Table B.1.1
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Incidental Soil Ingestion Rate, child (IRS_c)	200	mg/day
Age-adjusted soil ingestion factor (IFS_{adj})	105	(mg-year)/(kg-day)
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic analytes the intake is calculated as:

$$Intake = \frac{(C_s)(IFS_{adj})(EF)(CF)}{(AT)(365\ day/year)}$$

where: $$IFS_{adj} = \frac{(ED_c)(IRS_c)}{(BW_c)} + \frac{(ED_a)(IRS_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$Intake_{child} = \frac{(C_s)(IRS_c)(EF)(ED_c)(CF)}{(BW_c)(AT_{child})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration [3] (mg/kg) [4]	Carcinogenic Intake (mg/kg-day) [5]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SFo [6] $(mg/kg\text{-}day)^{-1}$ [7]	RfDo [8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds													
2,4-Dinitrotoluene	121-14-2	0.47	6.8E-07	0.000006	0.00000056	3.1E-01	2.0E-03	2.1E-07	1.0%	0.0030	0.060%	0.00028	0.060%
Benzo(a)pyrene	50-32-8	0.082	1.2E-07	--	--	7.3E+00	--	8.6E-07	4%	--	--	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	1.6E-07	--	--	7.0E+00	--	1.1E-06	5%	--	--	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--	--
Explosives								--	--	--	--	--	--
Nitroglycerine	55-63-0	1.5	2.2E-06	0.000019	0.0000018	1.7E-02	1.0E-04	3.7E-08	0.17%	0.19	3.8%	0.018	3.8%
Pesticides/PCB													
Aroclor-1254	11097-69-1	2.0	2.9E-06	0.000026	0.0000024	2.0E+00	2.0E-05	5.8E-06	26%	1.28	25%	0.12	25%
Metals													
Aluminum	7429-90-5	20000	--	0.255708	0.024	--	1.0E+00	--	--	0.26	5.1%	0.024	5.1%
Arsenic	7440-38-2	6.5	9.3E-06	0.000083	0.0000078	1.5E+00	3.0E-04	1.4E-05	64%	0.28	5.5%	0.026	5.5%
Cadmium	7440-43-9	120	--	0.001534	0.00014	--	1.0E-03	--	--	1.53	31%	0.14	31%
Cobalt	7440-48-4	12	--	0.000153	0.00001	--	3.0E-04	--	--	0.51	10%	0.05	10%
Copper	7440-50-8	850	--	0.010868	0.0010	--	4.0E-02	--	--	0.27	5.4%	0.025	5.4%
Manganese	7439-96-5	640	--	0.008183	0.00077	--	1.4E-01	--	--	0.058	1.2%	0.0055	1.2%
Mercury	7487-94-7	3.600	--	0.000046	0.0000043	--	3.0E-04	--	--	0.15	3.1%	0.014	3.1%
Silver	7440-22-4	24	--	0.000307	0.00003	--	5.0E-03	--	--	0.061	1.2%	0.0058	1.2%
Thallium	7440-28-0	0.27		0.000003	0.00000	--	1.0E-05	--	--	0.345	6.9%	0.0324	6.9%
Vanadium	7440-62-2	31.00	--	0.000396	0.00004	--	5.0E-03	--	--	0.079	1.6%	0.0074	1.6%
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums:	2E-05	100%	5	100%	0.5	100%
Chromium [9]													
Chromium (III)	16065-83-1	51	--	0.000652	0.000061	--	1.5E+00	--	--	0.00043	0.009% [10]	0.000041	0.0087% [10]
Chromium (VI)	18540-29-9	51	7.3E-05	0.000652	0.0000611	5.0E-01	3.0E-03	3.7E-05	63% [11]	0.22	4.149% [12]	0.020	4.1% [12]
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	2E-05	--	5.0	--	0.47	--
							Pathway Sums (including Chromium (VI)):	6E-05	--	5.2	--	0.49	--

Table B.1.1
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
(4) mg/kg = milligram per kilogram
(5) mg/kg-day = milligram per kilogram-day.
(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(10) Percent increase in cumulative hazard due to chromium (III).
(11) Percent increase in cumulative risk due to chromium (VI).
(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.1.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Event Frequency (EV)	1	event/day
Skin Surface Area, adult (SA_a)	6032	cm^2
Skin Surface Area, child (SA_c)	2690	cm^2
Age-adjusted dermal contact factor (SFS_{adj})	320.76	(mg-year)/(kg-event)
Dermal Adherence Factor, adult (AF_a)	0.07	mg/cm^2-event
Dermal Adherence Factor, child (AF_c)	0.2	mg/cm^2-event
Dermal Absorption Factor (ABS)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(C_s)(SFS_{adj})(ABS)(EF)(EV)(CF)}{(AT)(365\,days\,/\,year)}$$

where:

$$SFS_{adj} = \frac{(ED_c)(AF_c)(SA_c)}{(BW_c)} + \frac{(ED_a)(AF_a)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(C_s)(ED_c)(AF_c)(SA_c)(ABS)(EF)(EV)(CF)}{(BW_c)(AT_{child})(365 days/\,year)}$$

$$DAD_{adult} = \frac{(C_s)(ED_a)(AF_a)(SA_a)(ABS)(EF)(EV)(CF)}{(BW_a)(AT_{adult})(365\,days/\,year)}$$

Carcinogenic: $Risk = DAD \times SF_d$

Noncarcinogenic: $HQ = DAD \;/\; Rf_d$

		Exposure Point							Carcinogenic	Noncarcinogenic	Noncarcinogenic			Hazard		Hazard	
	CAS	Concentration (3)	ABS (5)	GIABS (6)	SFo (7)	RfDo (9)	SF_d (11)	RfD_d (12)	DAD (13)	DAD - Child	DAD - Adult	Cancer	% of	Quotient	% of	Quotient	% of
COPC (1)	Number (2)	(mg/kg) (4)	(unitless)	(unitless)	$(mg/kg\text{-}day)^{-1}$ (8)	(mg/kg-day) (10)	$(mg/kg\text{-}day)^{-1}$	(mg/kg-day)	(mg/kg-day) (14)	(mg/kg-day)	(mg/kg-day)	Risk	Total	Child	Total	Adult	Total
Semivolatile Organic Compounds																	
2,4-Dinitrotoluene	121-14-2	0.47	0.102	1	3.1E-01	2.0E-03	3.1E-01	2.0E-03	2.1E-07	1.6E-06	2.4E-07	6.5E-08	1.5%	0.00082	0.11%	0.00012	0.11%
Benzo(a)pyrene	50-32-8	0.082	0.13	1	7.3E+00		7.3E+00	--	4.7E-08	--	--	3.4E-07	8%	--	--	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	0.1	1	7.0E+00	--	7.0E+00	--	4.8E-08	--	--	3.4E-07	8%	--	--	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Explosives																	
Nitroglycerine	55-63-0	1.5	0.1	1	1.7E-02	1.0E-04	1.7E-02	1.0E-04	6.6E-07	5.2E-06	7.6E-07	1.1E-08	0.25%	0.052	7.2%	0.0076	7.2%
Pesticides/PCB																	
Aroclor-1254	11097-69-1	2.0	0.14	1	2.0E+00	2.0E-05	2.0E+00	2.0E-05	1.2E-06	9.6E-06	1.4E-06	2.5E-06	55%	0.48	67%	0.071	67%
Metals																	
Aluminum	7429-90-5	20000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.5	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	8.6E-07	6.7E-06	9.9E-07	1.3E-06	29%	0.02	3.10%	0.003	3%
Cadmium	7440-43-9	120	0.001	0.025	--	1.0E-03	--	2.5E-05	5.3E-07	4.1E-06	6.1E-07	--	--	0.17	23%	0.024	23%
Cobalt	7440-48-4	12	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--	--	--
Copper	7440-50-8	850	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	640	--	1	--	1.4E-01	--	1.4E-01	--	--	--	--	--	--	--	--	--
Mercury	7487-94-7	3.6	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--	--	--	--
Silver	7440-22-4	24	--	0.04	--	5.0E-03	--	2.0E-04	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	0.27	--	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	31	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums:	5E-06	100%	0.72	100%	0.11	100%
Chromium (15)																	
Chromium (III)	16065-83-1	51	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	51	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	5E-06	--	7E-01	--	1E-01	--
											Pathway Sums (including Chromium (VI)):	5E-06	--	7E-01	--	1E-01	--

Table B.1.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
(4) mg/kg = milligram per kilogram
(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).
(6) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) mg/kg-day = milligram per kilogram-day.
(11) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(12) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(13) DAD = Dermally absorbed dose.
(14) mg/kg-day = milligram per kilogram-day.
(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.

Table B.1.3

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC in air (C_a)	chemical-specific	µg/m^3
COPC in surface soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	350	days/yr
Exposure Duration (ED)	26	yrs
Fraction of day breathing air at site (ET)	1	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	26	yrs
Inhalation Unit Risk (IUR)	chemical-specific	(µg/m^3)$^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000\mu g/mg)(\frac{1}{VF} + \frac{1}{PEF})$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000\mu g/mg)(\frac{1}{PEF}) + (C_{sat})(1000\mu g/mg)(\frac{1}{VF})$$

where, for inorganics: $$C_a = (C_s)(1000\ \mu g/mg)(\frac{1}{PEF})$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration [3] (mg/kg) [4]	C_{sat} [5] (mg/kg)	Is EPC ≤ C_{sat} [6]?	Volatilization Factor [7] (m^3/kg) [8]	C_a (µg/m^3) [9]	Carcinogenic EC(air) (µg/m^3)	Noncarcinogenic EC(air) (µg/m^3)	IUR [10] (µg/m^3)$^{-1}$ [11]	RfC [12] (mg/m^3) [13]	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
2,4-Dinitrotoluene	121-14-2	0.47	1.5E+02	Yes	4.6E+05	1.0E-03	3.6E-04	--	8.9E-05	--	3.2E-08	2.9%	--	--
Benzo(a)pyrene	50-32-8	0.082	1.0E+01	Yes	3.2E+07	2.6E-06	9.3E-07	--	1.1E-03	--	1.0E-09	0.09%	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	1.4E+03	Yes	1.4E+05	7.6E-04	2.7E-04	--	2.0E-03	--	5.4E-07	49%	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--	--	--
Explosives														
Nitroglycerine	55-63-0	1.5	9.6E+02	Yes	6.3E+05	2.4E-03	--	--	--	--	--	--	--	--
Pesticides/PCB														
Aroclor-1254	11097-69-1	2.0	3.4E+01	Yes	9.3E+05	2.2E-03	7.7E-04	--	5.7E-04	--	4.4E-07	39%	--	--
Metals														
Aluminum	7429-90-5	20000	N/A	N/A	N/A	1.5E-02	--	1.5E-02	--	5.0E-03	--	--	0.003	13%
Arsenic	7440-38-2	6.5	N/A	N/A	N/A	4.9E-06	1.8E-06	4.7E-06	4.3E-03	1.5E-05	7.6E-09	0.7%	0.000	1%
Cadmium	7440-43-9	120	N/A	N/A	N/A	9.1E-05	3.2E-05	8.7E-05	1.8E-03	1.0E-05	5.8E-08	5.3%	0.009	38%
Cobalt	7440-48-4	12	N/A	N/A	N/A	9.1E-06	3.2E-06	8.7E-06	9.0E-03	6.0E-06	2.9E-08	2.6%	0.001	6%
Copper	7440-50-8	850	N/A	N/A	N/A	6.5E-04	--	--	--	--	--	--	--	--
Manganese	7439-96-5	640	N/A	N/A	N/A	4.9E-04		4.7E-04		5.0E-05	--	--	0.009	41%
Mercury	7487-94-7	3.6	N/A	N/A	N/A	2.7E-06	--	2.6E-06	--	3.0E-04	--	--	0.000009	0.038%
Silver	7440-22-4	24	N/A	N/A	N/A	1.8E-05	--	--	--	--	--	--	--	--
Thallium	7440-28-0	0.27	N/A	N/A	N/A	2.1E-07	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	31	N/A	N/A	N/A	2.4E-05	8.4E-06	2.3E-05	--	1.0E-04	--	--	0.0002	1.0%
											Cancer Risk		**Hazard Index**	
										Pathway Sums:	1.1E-06	100%	0.023	100%
Chromium [14]														
Chromium (III)	16065-83-1	51	N/A	N/A	N/A	3.9E-05	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	51	N/A	N/A	N/A	3.9E-05	1.4E-05	3.7E-05	8.4E-02	1.0E-04	1.2E-06	51% [15]	0.0004	2% [16]
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	1E-06	--	0.02	--
										Pathway Sums (including Chromium (VI)):	2E-06	--	0.02	--

Table B.1.3
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
(4) mg/kg = milligram per kilogram
(5) C_{sat} is the soil saturation concentration. C_{sat} is calculated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.
(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.
(7) See Table B.3.2 for the calculation of VF.
(8) m^3/kg = cubic meters per kilogram.
(9) µg/m^3 = micrograms per cubic meter.
(10) IUR is the inhalation unit risk.   IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(11) (µg/m^3)$^{-1}$ = inverse of micrograms per cubic meter.
(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) mg/m^3 = milligrams per cubic meter.
(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(15) Percent increase in cumulative risk due to chromium (VI).
(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A - Not Applicable. C_{sat} is calculated for organic COPCs only.

Table B.1.4

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	330	mg/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration, adult (ED_a)	1	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration [3] (mg/kg) [4]	Carcinogenic Intake (mg/kg-day) [5]	Noncarcinogenic Intake (mg/kg-day)	SFo [6] $(mg/kg\text{-}day)^{-1}$ [7]	RfDo [8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds										
2,4-Dinitrotoluene	121-14-2	0.47	2.3E-09	1.6E-07	3.1E-01	2.0E-03	7.0E-10	0.9%	0.00008	0.060%
Benzo(a)pyrene	50-32-8	0.082	4.0E-10	2.8E-08	7.3E+00	--	2.9E-09	4%	--	--
Benzo(ghi)perylene	191-24-2	0.048	2.3E-10	1.6E-08	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	5.3E-10	3.7E-08	7.0E+00	--	3.7E-09	5%	--	--
Phenanthrene	85-01-8	0.038	1.8E-10	1.3E-08	--	--	--	--	--	--
Explosives										
Nitroglycerine	55-63-0	1.5	7.3E-09	5.1E-07	1.7E-02	1.0E-04	1.2E-10	0.17%	0.005	3.8%
Pesticides/PCB										
Aroclor-1254	11097-69-1	2	9.7E-09	6.8E-07	2.0E+00	2.0E-05	1.9E-08	26%	0.034	25%
Metals										
Aluminum	7429-90-5	20000	--	6.8E-03	--	1.0E+00	--	--	0.0068	5.1%
Arsenic	7440-38-2	6.5	3.1E-08	2.2E-06	1.5E+00	3.0E-04	4.7E-08	64%	0.007	5.5%
Cadmium	7440-43-9	120	--	4.1E-05	--	1.0E-03	--	--	0.041	31%
Cobalt	7440-48-4	12	--	4.1E-06	--	3.0E-04	--	--	0.014	10%
Copper	7440-50-8	850	--	2.9E-04	--	4.0E-02	--	--	0.0072	5.4%
Manganese	7439-96-5	640	--	2.2E-04	--	1.4E-01	--	--	0.00155	1.2%
Mercury	7487-94-7	3.600	--	1.2E-06	--	3.0E-04	--	--	0.0041	3.1%
Silver	7440-22-4	24	--	8.1E-06	--	5.0E-03	--	--	0.00163	1.2%
Thallium	7440-28-0	0.27	--	9.2E-08	--	1.0E-05	--	--	0.00915	6.9%
Vanadium	7440-62-2	31	--	1.1E-05	--	5.0E-03	--	--	0.00210	1.6%
							Cancer Risk		**Hazard Index**	
						Pathway Sums:	7E-08	100%	0.13	100%
Chromium [9]										
Chromium (III)	16065-83-1	51	2.5E-07	1.7E-05	--	1.5E+00	--	--	0.000012	0.009% [10]
Chromium (VI)	18540-29-9	51	2.5E-07	1.7E-05	5.0E-01	3.0E-03	1.2E-07	63% [11]	0.0058	4.1% [12]
							Cancer Risk		**Hazard Index**	
						Pathway Sums (including Chromium(III)):	7E-08	--	0.13	--
						Pathway Sums (including Chromium (VI)):	2E-07	--	0.14	--

[1] COPC = Constituent of potential concern.

[2] CAS = Chemical Abstracts Service number.

[3] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

[4] mg/kg = milligram per kilogram

[5] mg/kg-day = milligram per kilogram-day.

[6] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-

[7] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

[8] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-

[9] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

[10] Percent increase in cumulative hazard due to chromium (III).

[11] Percent increase in cumulative risk due to chromium (VI).

[12] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.1.5
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Event Frequency (EV)	1	events/ day
Skin Surface Area (SA_a)	3470	cm^2
Dermal Adherence Factor (AF_a)	0.12	mg/cm^2-day
Dermal Absorption Factor (ABS)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EF)(ED_a)(EV)(SA_a)}{(BW_a)(AT)(365 days / year)}$$

where: $$DA_{event} = (C_s)(AF_a)(ABS)(CF)$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (mg/kg) [4]	ABS [5] (unitless)	GIABS [6] (unitless)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	SF_d [10] $(mg/kg\text{-}day)^{-1}$	RfD_d [11] (mg/kg-day)	DA_{event} $(mg/cm^2\text{-}event)$ [12]	Carcinogenic DAD [13] (mg/kg-day) [14]	Noncarcinogenic DAD (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds															
2,4-Dinitrotoluene	121-14-2	0.47	0.102	1	3.1E-01	2.0E-03	3.1E-01	2.0E-03	5.7E-09	2.9E-10	2.0E-08	9.0E-11	1.4%	0.000010	0.11%
Benzo(a)pyrene	50-32-8	0.082	0.13	1	7.3E+00	--	7.3E+00	--	1.3E-09	6.5E-11	4.6E-09	4.8E-10	8%	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	0.1	1	7.0E+00	--	7.0E+00	--	1.3E-09	6.7E-11	4.7E-09	4.7E-10	8%	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--	--	--	--
Explosives															
Nitroglycerine	55-63-0	1.5	0.1	1	1.7E-02	1.0E-04	1.7E-02	1.0E-04	1.8E-08	9.2E-10	6.4E-08	1.6E-11	0.25%	0.00064	7.2%
Pesticides/PCB															
Aroclor-1254	11097-69-1	2	0.14	1	2.0E+00	2.0E-05	2.0E+00	2.0E-05	3.4E-08	1.7E-09	1.2E-07	3.4E-09	55%	0.0060	67%
Metals															
Aluminum	7429-90-5	20000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.5	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.3E-08	1.2E-09	8.3E-08	1.8E-09	29%	0.00028	3.1%
Cadmium	7440-43-9	120	0.001	0.025	--	1.0E-03	--	2.5E-05	1.4E-08	--	5.1E-08	--	--	0.0021	23%
Cobalt	7440-48-4	12	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--
Copper	7440-50-8	850	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--	--
Manganese	7439-96-5	640	--	1	--	1.4E-01	--	1.4E-01	--	--	--	--	--	--	--
Mercury	7487-94-7	3.6	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--	--
Silver	7440-22-4	24	--	0.04	--	5.0E-03	--	2.0E-04	--	--	--	--	--	--	--
Thallium	7440-28-0	0.27	--	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--	--
Vanadium	7440-62-2	31	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums:	6E-09	100%	0.0090	100%
Chromium [15]															
Chromium (III)	16065-83-1	51	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	51	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	6E-09	--	0.0090	--
											Pathway Sums (including Chromium (VI)):	6E-09	--	0.0090	--

Table B.1.5
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

(4) mg/kg = milligram per kilogram

(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).

(6) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(11) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(12) mg/cm^2-event = milligram per squared centimeter per event.

(13) DAD = Dermally absorbed dose.

(14) mg/kg-day = milligram per kilogram-day.

(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

Table B.1.6

HYPOTHETICAL EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL EXCAVATION/CONSTRUCTION WORKER	
COPC in soil (C_s)	chemical-specific	mg/kg
COPC in air (C_a)	chemical-specific	$\mu g/m^3$
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Fraction of EF breathing air at site (ET)	0.333	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Inhalation Unit Risk (IUR)	chemical-specific	$(\mu g/m^3)^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000\mu g/mg)\left(\frac{1}{VF} + \frac{1}{PEF}\right)$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000\mu g/mg)\left(\frac{1}{PEF}\right) + (C_{sat})(1000\mu g/mg)\left(\frac{1}{VF}\right)$$

where, for inorganics: $$C_a = (C_s)(1000\ \mu g/mg)\left(\frac{1}{PEF}\right)$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC(1)	CAS Number(2)	Soil Exposure Point Concentration (3) (mg/kg) (4)	C_{sat} (5) (mg/kg)	Is EPC ≤ C_{sat} (6)?	Volatilization Factor (7) (m^3/kg) (8)	C_a ($\mu g/m^3$) (9)	Carcinogenic EC(air) ($\mu g/m^3$)	Noncarcinogenic EC(air) ($\mu g/m^3$)	IUR (10) $(\mu g/m^3)^{-1}$ (11)	RfC (12) (mg/m^3) (13)	Cancer Risk	% of Total		Hazard Quotient	% of Total	
Semivolatile Organic Compounds																
2,4-Dinitrotoluene	121-14-2	0.47	1.5E+02	Yes	4.6E+05	1.0E-03	4.0E-07	--	8.9E-05	--	3.5E-11	2.9%		--	--	
Benzo(a)pyrene	50-32-8	0.082	1.0E+01	Yes	3.2E+07	2.6E-06	1.0E-09	--	1.1E-03	--	1.1E-12	0.09%		--		
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--		--	--	
N-Nitrosodipropylamine	621-64-7	0.11	1.4E+03	Yes	1.4E+05	7.6E-04	3.0E-07	--	2.0E-03	--	6.0E-10	49%		--	--	
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--		--	--	
Explosives																
Nitroglycerine	55-63-0	1.5	9.6E+02	Yes	6.3E+05	2.4E-03	--	--	--	--	--	--		--	--	
Pesticides/PCB																
Aroclor-1254	11097-69-1	2.0	3.4E+01	Yes	9.3E+05	2.2E-03	8.4E-07	--	5.7E-04	--	4.8E-10	39%		--	--	
Metals																
Aluminum	7429-90-5	20000	N/A	N/A	N/A	1.5E-02	5.9E-06	4.2E-04	--	5.0E-03	--	--		0.000083	13%	
Arsenic	7440-38-2	6.5	N/A	N/A	N/A	4.9E-06	1.9E-09	1.4E-07	4.3E-03	1.5E-05	8.3E-12	0.7%		0.00001	1%	
Cadmium	7440-43-9	120	N/A	N/A	N/A	9.1E-05	3.6E-08	2.5E-06	1.8E-03	1.0E-05	6.4E-11	5.3%		0.00025	38%	
Cobalt	7440-48-4	12	N/A	N/A	N/A	9.1E-06	3.6E-09	2.5E-07	9.0E-03	6.0E-06	3.2E-11	2.6%		0.00004	6%	
Copper	7440-50-8	850	N/A	N/A	N/A	6.5E-04	--	--	--	--	--	--		--	--	
Manganese	7439-96-5	640	N/A	N/A	N/A	4.9E-04	1.9E-07	1.3E-05	--	5.0E-05	--	--		0.00027	41%	
Mercury	7487-94-7	3.6	N/A	N/A	N/A	2.7E-06	1.1E-09	7.5E-08	--	3.0E-04	--	--		0.00000025	0.038%	
Silver	7440-22-4	24	N/A	N/A	N/A	1.8E-05	7.1E-09	--	--	--	--	--		--	--	
Thallium	7440-28-0	0.27	N/A	N/A	N/A	2.1E-07	--	--	--	--	--	--		--	--	
Vanadium	7440-62-2	31	N/A	N/A	N/A	2.4E-05	9.2E-09	6.4E-07	--	1.0E-04	--	--		0.0000064	1.0%	
											Cancer Risk			**Hazard Index**		
										Pathway Sums:	1E-09	100%		0.00066	100%	
Chromium (14)																
Chromium (III)	16065-83-1	51	N/A	N/A	N/A	3.9E-05	1.5E-08	--	--	--	--	--		--	--	
Chromium (VI)	18540-29-9	51	N/A	N/A	N/A	3.9E-05	1.5E-08	1.1E-06	8.4E-02	1.0E-04	1.3E-09	51%	(15)	0.000011	2%	(16)
											Cancer Risk			**Hazard Index**		
										Pathway Sums (including Chromium(III)):	1E-09	--		0.00066	--	
										Pathway Sums (including Chromium (VI)):	2E-09	--		0.00067	--	

Table B.1.6

HYPOTHETICAL EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

(4) mg/kg = milligram per kilogram

(5) C_{sat} is the soil saturation concentration. C_{sat} is calculated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.

(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) µg/m^3 = micrograms per cubic meter.

(10) IUR is the inhalation unit risk. IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.

(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A - Not Applicable. C_{sat} is calculated for organic COPCs only.

Table B.1.7

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, adult (ED_a)	25	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration[3] (mg/kg)[4]	Carcinogenic Intake (mg/kg-day)[5]	Noncarcinogenic Intake (mg/kg-day)	SFo[6] $(mg/kg\text{-}day)^{-1}$[7]	RfDo[8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds										
2,4-Dinitrotoluene	121-14-2	0.47	1.3E-07	3.6E-07	3.1E-01	2.0E-03	4.0E-08	0.9%	0.00018	0.060%
Benzo(a)pyrene	50-32-8	0.082	2.3E-08	--	7.3E+00	--	1.6E-07	4%	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--				
N-Nitrosodipropylamine	621-64-7	0.11	3.0E-08	--	7.0E+00	--	2.1E-07	5%	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--
Explosives										
Nitroglycerine	55-63-0	1.5	4.1E-07	1.2E-06	1.7E-02	1.0E-04	7.0E-09	0.17%	0.012	3.8%
Pesticides/PCB										
Aroclor-1254	11097-69-1	2.0	5.5E-07	1.5E-06	2.0E+00	2.0E-05	1.1E-06	26%	0.077	25%
Metals										
Aluminum	7429-90-5	20000	--	1.5E-02	--	1.0E+00	--	--	0.015	5.1%
Arsenic	7440-38-2	6.5	1.8E-06	5.0E-06	1.5E+00	3.0E-04	2.7E-06	64%	0.017	6%
Cadmium	7440-43-9	120	--	9.2E-05	--	1.0E-03	--	--	0.092	31%
Cobalt	7440-48-4	12		9.2E-06	--	3.0E-04	--	--	0.031	10%
Copper	7440-50-8	850	--	6.5E-04	--	4.0E-02	--	--	0.016	5.4%
Manganese	7439-96-5	640	--	4.9E-04	--	1.4E-01	--	--	0.0035	1.2%
Mercury	7487-94-7	3.600	--	2.8E-06	--	3.0E-04	--	--	0.0092	3.1%
Silver	7440-22-4	24	--	1.8E-05	--	5.0E-03	--	--	0.0037	1.2%
Thallium	7440-28-0	0.27		2.1E-07	--	1.0E-05	--	--	0.021	7%
Vanadium	7440-62-2	31	--	2.4E-05	--	5.0E-03	--	--	0.0048	1.6%
							Cancer Risk		**Hazard Index**	
						Pathway Sums:	4.2E-06	100%	0.3	100%
Chromium[9]										
Chromium (III)	16065-83-1	51	--	3.9E-05	--	1.5E+00	--	--	0.000026	0.009% [10]
Chromium (VI)	18540-29-9	51	1.4E-05	3.9E-05	5.0E-01	3.0E-03	7.0E-06	63% [11]	0.013	4% [12]
							Cancer Risk		**Hazard Index**	
						Pathway Sums (including Chromium(III)):	4.2E-06	--	0.30	--
						Pathway Sums (including Chromium (VI)):	1.1E-05	--	0.32	--

Table B.1.7
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
(4) mg/kg = milligram per kilogram
(5) mg/kg-day = milligram per kilogram-day.
(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014
(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(10) Percent increase in cumulative hazard due to chromium (III).
(11) Percent increase in cumulative risk due to chromium (VI).
(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.1.8
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Exposure Duration (ED)	25	yrs
Event Frequency (EV)	1	events/ day
Skin Surface Area (SA_a)	3470	cm^2
Dermal Adherence Factor (AF_d)	0.12	mg/cm^2-day
Dermal Absorption Factor (ABS_d)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EF)(ED_a)(EV)(SA_a)}{(BW_a)(AT)(365 days / year)}$$

where: $$DA_{event} = (C_s)(AF_a)(ABS)(CF)$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (mg/kg) [4]	ABS [5] (unitless)	GIABS [6] (unitless)	SFo [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfDo [9] (mg/kg-day)	SF_d [10] $(mg/kg\text{-}day)^{-1}$	RfD_d [11] (mg/kg-day)	DA_{event} (mg/cm^2-event) [12]	Carcinogenic DAD [13] (mg/kg-day) [14]	Noncarcinogenic DAD (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds															
2,4-Dinitrotoluene	121-14-2	0.47	0.102	1	3.1E-01	2.0E-03	3.1E-01	2.0E-03	5.7E-09	5.5E-08	1.5E-07	1.7E-08	1.4%	0.00008	0.11%
Benzo(a)pyrene	50-32-8	0.082	0.13	1	7.3E+00		7.3E+00		1.3E-09	1.2E-08	--	8.9E-08	8%	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--		--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	0.1	1	7.0E+00	--	7.0E+00	--	1.3E-09	1.3E-08	--	8.8E-08	8%	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--				
Explosives															
Nitroglycerine	55-63-0	1.5	0.1	1	1.7E-02	1.0E-04	1.7E-02	1.0E-04	1.8E-08	1.7E-07	4.8E-07	2.9E-09	0.25%	0.005	7.2%
Pesticides/PCB															
Aroclor-1254	11097-69-1	2	0.14	1	2.0E+00	2.0E-05	2.0E+00	2.0E-05	3.4E-08	3.2E-07	9.0E-07	6.4E-07	55%	0.04	67%
Metals															
Aluminum	7429-90-5	20000	--	1	--	1.0E+00	--	1.0E+00	--	--	--				
Arsenic	7440-38-2	6.5	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.3E-08	2.2E-07	6.3E-07	3.4E-07	29%	0.002	3.1%
Cadmium	7440-43-9	120	0.001	0.025	--	1.0E-03	--	2.5E-05	1.4E-08	--	3.9E-07	--	--	0.02	23%
Cobalt	7440-48-4	12	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--
Copper	7440-50-8	850	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--	--
Manganese	7439-96-5	640	--	1	--	1.4E-01	--	1.4E-01	--	--	--	--	--	--	--
Mercury	7487-94-7	3.6	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--	--
Silver	7440-22-4	24	--	0.04	--	5.0E-03	--	2.0E-04	--	--	--	--	--	--	--
Thallium	7440-28-0	0.27	--	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--	--
Vanadium	7440-62-2	31	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums:	1E-06	100%	0.07	100%
Chromium [15]															
Chromium (III)	16065-83-1	51	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	51	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	1E-06	--	0.07	--
											Pathway Sums (including Chromium (VI)):	1E-06	--	0.07	--

Table B.1.8
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
(4) mg/kg = milligram per kilogram
(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).
(6) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(11) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final
(12) mg/cm^2-event = milligram per squared centimeter per event.
(13) DAD = Dermally absorbed dose.
(14) mg/kg-day = milligram per kilogram-day.
(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.

Table B.1.9
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC in soil (C_s)	chemical-specific	mg/kg
COPC in air (C_a)	chemical-specific	µg/m^3
Exposure Frequency (EF)	225	days/yr
Exposure Duration (ED)	25	yrs
Fraction of EF breathing air at site (ET)	0.333	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Inhalation Unit Risk (IUR)	chemical-specific	(µg/m^3)$^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}:

$$C_a = (C_s)(1{,}000 \mu g/mg)(\frac{1}{VF} + \frac{1}{PEF})$$

where, if EPC > C_{sat}:

$$C_a = (C_s)(1000 \mu g/mg)(\frac{1}{PEF}) + (C_{sat})(1000 \mu g/mg)(\frac{1}{VF})$$

where, for inorganics:

$$C_a = (C_s)(1000\ \mu g/mg)(\frac{1}{PEF})$$

Carcinogenic:

$$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic:

$$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC(1)	CAS Number(2)	Soil Exposure Point Concentration (3) (mg/kg) (4)	C_{sat} (5) (mg/kg)	Is EPC ≤ C_{sat} (6)?	Volatilization Factor (7) (m^3/kg) (8)	C_a (µg/m^3) (9)	Carcinogenic EC(air) (µg/m^3)	Noncarcinogenic EC(air) (µg/m^3)	IUR (10) (µg/m^3)$^{-1}$ (11)	RfC (12) (mg/m^3) (13)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
2,4-Dinitrotoluene	121-14-2	0.47	1.5E+02	Yes	4.6E+05	1.0E-03	7.5E-05	--	8.9E-05	--	6.6E-09	2.9%	--	--
Benzo(a)pyrene	50-32-8	0.082	1.0E+01	Yes	3.2E+07	2.6E-06	1.9E-07	--	1.1E-03	--	2.1E-10	0.093%	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	1.4E+03	Yes	1.4E+05	7.6E-04	5.6E-05	--	2.0E-03	--	1.1E-07	49%	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--	--	--
Explosives														
Nitroglycerine	55-63-0	1.5	9.6E+02	Yes	6.3E+05	2.4E-03	--	--	--	--	--	--	--	--
Pesticides/PCB														
Aroclor-1254	11097-69-1	2.0	3.4E+01	Yes	9.3E+05	2.2E-03	1.6E-04	4.4E-04	5.7E-04	--	9.0E-08	39%	--	--
Metals														
Aluminum	7429-90-5	20000	N/A	N/A	N/A	1.5E-02	--	3.1E-03	--	5.0E-03	--	--	0.00062	13%
Arsenic	7440-38-2	6.5	N/A	N/A	N/A	4.9E-06	3.6E-07	1.0E-06	4.3E-03	1.5E-05	1.6E-09	0.7%	0.000068	1%
Cadmium	7440-43-9	120	N/A	N/A	N/A	9.1E-05	6.7E-06	1.9E-05	1.8E-03	1.0E-05	1.2E-08	5.3%	0.0019	38%
Cobalt	7440-48-4	12	N/A	N/A	N/A	9.1E-06	6.7E-07	1.9E-06	9.0E-03	6.0E-06	6.0E-09	2.6%	0.00031	6%
Copper	7440-50-8	850	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	640	N/A	N/A	N/A	4.9E-04	--	1.0E-04	--	5.0E-05	--	--	0.0020	41%
Mercury	7487-94-7	3.6	N/A	N/A	N/A	2.7E-06	--	5.6E-07	--	3.0E-04	--	--	0.0000019	0.038%
Silver	7440-22-4	24	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	0.27	N/A	N/A	N/A	2.1E-07	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	31	N/A	N/A	N/A	2.4E-05	--	4.8E-06	--	1.0E-04	--	--	0.000048	1.0%
											Cancer Risk		**Hazard Index**	
										Pathway Sums:	2.3E-07	100%	0.0049	100%
Chromium (14)														
Chromium (III)	16065-83-1	51	N/A	N/A	N/A	3.9E-05	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	51	N/A	N/A	N/A	3.9E-05	2.8E-06	8.0E-06	8.4E-02	1.0E-04	2.4E-07	51% (15)	0.000080	1.6% (16)
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	2.3E-07	--	0.0049	--
										Pathway Sums (including Chromium (VI)):	4.7E-07	--	0.0050	--

Table B.1.9

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

(4) mg/kg = milligram per kilogram

(5) C_{sat} is the soil saturation concentration. C_{sat} is calculated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.

(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) µg/m^3 = micrograms per cubic meter.

(10) IUR is the inhalation unit risk. IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.

(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A - Not Applicable. C_{sat} is calculated for organic COPCs only.

Table B.1.10
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')
Open Detonation Hill Area -Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Incidental Soil Ingestion Rate, child (IRS_c)	200	mg/day
Age-adjusted soil ingestion factor (IFS_{adj})	105	(mg-year)/(kg-day)
Exposure Frequency (EF)	24	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic analytes the intake is calculated as:

$$Intake = \frac{(C_s)(IFS_{adj})(EF)(CF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFS_{adj} = \frac{(ED_c)(IRS_c)}{(BW_c)} + \frac{(ED_a)(IRS_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$Intake_{child} = \frac{(C_s)(IRS_c)(EF)(ED_c)(CF)}{(BW_c)(AT_{child})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration [3] (mg/kg) [4]	Carcinogenic Intake (mg/kg-day) [5]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SFo [6] (mg/kg-day)$^{-1}$ [7]	RfDo [8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds													
2,4-Dinitrotoluene	121-14-2	0.47	4.6E-08	4.1E-07	3.8E-08	3.1E-01	2.0E-03	1.4E-08	0.9%	0.0002	0.060%	0.000019	0.060%
Benzo(a)pyrene	50-32-8	0.082	8.1E-09	--	--	7.3E+00	--	5.9E-08	4%	--	--	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--		--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	1.1E-08	--	--	7.0E+00	--	7.6E-08	5%	--	--	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--			--	--	--	--
Explosives													
Nitroglycerine	55-63-0	1.5	1.5E-07	1.3E-06	1.2E-07	1.7E-02	1.0E-04	2.5E-09	0.17%	0.0132	3.8%	0.0012	3.8%
Pesticides/PCB													
Aroclor-1254	11097-69-1	2.0	2.0E-07	1.8E-06	1.6E-07	2.0E+00	2.0E-05	3.9E-07	26%	0.0877	25%	0.0082	25%
Metals													
Aluminum	7429-90-5	20000	--	1.8E-02	1.6E-03	--	1.0E+00	--	--	0.0175	5.1%	0.0016	5.1%
Arsenic	7440-38-2	6.5	6.4E-07	5.7E-06	5.3E-07	1.5E+00	3.0E-04	9.6E-07	64%	0.0190	6%	0.0018	6%
Cadmium	7440-43-9	120	--	1.1E-04	9.9E-06	--	1.0E-03	--	--	0.1052	31%	0.010	31%
Cobalt	7440-48-4	12	--	1.1E-05	9.9E-07	--	3.0E-04	--	--	0.0351	10%	0.003	10%
Copper	7440-50-8	850	--	7.5E-04	7.0E-05	--	4.0E-02	--	--	0.0186	5.4%	0.0017	5.4%
Manganese	7439-96-5	640	--	5.6E-04	5.3E-05	--	1.4E-01	--	--	0.0040	1.2%	0.00038	1.2%
Mercury	7487-94-7	3.600	--	3.2E-06	3.0E-07	--	3.0E-04	--	--	0.0105	3.1%	0.0010	3.1%
Silver	7440-22-4	24	--	2.1E-05	2.0E-06	--	5.0E-03	--	--	0.0042	1.2%	0.00039	1.2%
Thallium	7440-28-0	0.27	--	2.4E-07	2.2E-08	--	1.0E-05	--	--	0.0237	7%	0.002	7%
Vanadium	7440-62-2	31	--	2.7E-05	2.5E-06	--	5.0E-03	--	--	0.0054	1.6%	0.00051	1.6%
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums:	2E-06	100%	0.3	100%	0.03	100%
Chromium [9]													
Chromium (III)	16065-83-1	51	--	4.5E-05	4.2E-06	--	1.5E+00	--	--	0.0000	0.004% [10]	0.0000028	0.0042% [10]
Chromium (VI)	18540-29-9	51	5.0E-06	4.5E-05	4.2E-06	5.0E-01	3.0E-03	2.5E-06	63% [11]	0.015	2.1% [12]	0.0014	2.1% [12]
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	2E-06	--	0.7	--	0.07	--
							Pathway Sums (including Chromium (VI)):	4E-06	--	0.7	--	0.07	--

Table B.1.10
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')
Open Detonation Hill Area -Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

(4) mg/kg = milligram per kilogram

(5) mg/kg-day = milligram per kilogram-day.

(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(10) Percent increase in cumulative hazard due to chromium (III).

(11) Percent increase in cumulative risk due to chromium (VI).

(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.1.11
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	24	days/yr
Exposure Duration, adult (Ed_a)	20	yrs
Exposure Duration, child (Ed_c)	6	yrs
Event Frequency (EV)	1	event/day
Skin Surface Area, adult (SA_a)	6032	cm^2
Skin Surface Area, child (SA_c)	2690	cm^2
Age-adjusted dermal contact factor (SFS_{adj})	320.76	(mg-year)/(kg-day)
Dermal Adherence Factor, adult (AF_a)	0.07	mg/cm^2-day
Dermal Adherence Factor, child (AF_c)	0.2	mg/cm^2-day
Dermal Absorption Factor (ABS)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(C_s)(SFS_{adj})(ABS)(EF)(EV)(CF)}{(AT)(365\,days/year)}$$

where: $$SFS_{adj} = \frac{(ED_c)(AF_c)(SA_c)}{(BW_c)} + \frac{(ED_a)(AF_a)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(C_s)(ED_c)(AF_c)(SA_c)(ABS)(EF)(EV)(CF)}{(BW_c)(AT_{child})(365\,days/year)}$$

$$DAD_{adult} = \frac{(C_s)(ED_a)(AF_a)(SA_a)(ABS)(EF)(EV)(CF)}{(BW_a)(AT_{adult})(365\,days/year)}$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (mg/kg) (4)	ABS (5) (unitless)	GIABS (6) (unitless)	SFo (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfDo (9) (mg/kg-day) (10)	SF_d (11) $(mg/kg\text{-}day)^{-1}$	RfD_d (12) (mg/kg-day)	Carcinogenic DAD (13) (mg/kg-day)	Noncarcinogenic DAD - Child (mg/kg-day)	Noncarcinogenic DAD - Adult (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																	
2,4-Dinitrotoluene	121-14-2	0.47	0.102	1	3.1E-01	2.0E-03	3.1E-01	2.0E-03	1.4E-08	1.1E-07	1.7E-08	4.5E-09	1.4%	0.00006	0.11%	0.0000083	0.11%
Benzo(a)pyrene	50-32-8	0.082	0.13	1	7.3E+00		7.3E+00		3.2E-09	--	--	2.3E-08	8%	--	--	--	--
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	0.11	0.1	1	7.0E+00	--	7.0E+00	--	3.3E-09	--	--	2.3E-08	8%	--	--	--	--
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Explosives																	
Nitroglycerine	55-63-0	1.5	0.1	1	1.7E-02	1.0E-04	1.7E-02	1.0E-04	4.5E-08	3.5E-07	5.2E-08	7.7E-10	0.25%	0.0035	7.2%	0.00052	7.2%
Pesticides/PCB																	
Aroclor-1254	11097-69-1	2	0.14	1	2.0E+00	2.0E-05	2.0E+00	2.0E-05	8.4E-08	6.6E-07	9.7E-08	1.7E-07	55%	0.033	67%	0.0049	67%
Metals																	
Aluminum	7429-90-5	20000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.5	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	5.9E-08	4.6E-07	6.8E-08	8.8E-08	29%	0.002	3%	0.0002	3%
Cadmium	7440-43-9	120	0.001	0.025	--	1.0E-03	--	2.5E-05	--	2.8E-07	4.2E-08	--	--	0.011	23%	0.0017	23%
Cobalt	7440-48-4	12	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--	--	--
Copper	7440-50-8	850	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	640	--	1	--	1.4E-01	--	1.4E-01	--	--	--	--	--	--	--	--	--
Mercury	7487-94-7	3.6	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--	--	--	--
Silver	7440-22-4	24	--	0.04	--	5.0E-03	--	2.0E-04	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	0.27	--	1	--	1.0E-05	--	1.0E-05									
Vanadium	7440-62-2	31	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway sum:	3.1E-07		0.049		0.0073	
Chromium (15)																	
Chromium (III)	16065-83-1	51	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	51	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	3.1E-07	--	0.049	--	0.0073	--
											Pathway Sums (including Chromium (VI)):	3.1E-07	--	0.049	--	0.0073	--

Table B.1.11
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.
(4) mg/kg = milligram per kilogram
(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).
(6) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) mg/kg-day = milligram per kilogram-day.
(11) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(12) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(13) DAD = Dermally absorbed dose.
(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.

Table B.1.12

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC in air (C_a)	chemical-specific	$\mu g/m^3$
COPC in surface soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	24	days/yr
Exposure Duration (ED)	26	yrs
Fraction of EF breathing air at site (ET)	0.17	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	26	yrs
Inhalation Unit Risk (IUR)	chemical-specific	$(\mu g/m^3)^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000 \mu g/mg)\left(\frac{1}{VF} + \frac{1}{PEF}\right)$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000 \mu g/mg)\left(\frac{1}{PEF}\right) + (C_{sat})(1000 \mu g/mg)\left(\frac{1}{VF}\right)$$

where, for inorganics: $$C_a = (C_s)(1000\ \mu g/mg)\left(\frac{1}{PEF}\right)$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration [3] (mg/kg) [4]	C_{sat} [5] (mg/kg)	Is EPC ≤ C_{sat} [6]?	Volatilization Factor [7] (m^3/kg) [8]	C_a ($\mu g/m^3$) [9]	Carcinogenic EC(air) ($\mu g/m^3$)	Noncarcinogenic EC(air) ($\mu g/m^3$)	IUR [10] $(\mu g/m^3)^{-1}$ [11]	RfC [12] (mg/m^3) [13]	Cancer Risk	% of Total		Hazard Quotient	% of Total	
Semivolatile Organic Compounds																
2,4-Dinitrotoluene	121-14-2	0.47	1.5E+02	Yes	4.6E+05	1.0E-03	4.2E-06	--	8.9E-05	--	4E-10	3.2%		--	--	
Benzo(a)pyrene	50-32-8	0.082	1.0E+01	Yes	3.2E+07	2.6E-06	1.1E-08	--	1.1E-03	--	1E-11	0.10%		--	--	
Benzo(ghi)perylene	191-24-2	0.048	--	--	--	--	--		--	--	--	--		--	--	
N-Nitrosodipropylamine	621-64-7	0.11	1.4E+03	Yes	1.4E+05	7.6E-04	3.2E-06	--	2.0E-03	--	6E-09	53%		--	--	
Phenanthrene	85-01-8	0.038	--	--	--	--	--	--	--	--	--	--		--	--	
Explosives																
Nitroglycerine	55-63-0	1.5	9.6E+02	Yes	6.3E+05	2.4E-03	--	--	--	--	--	--		--	--	
Pesticides/PCB																
Aroclor-1254	11097-69-1	2.0	3.4E+01	Yes	9.3E+05	2.2E-03	8.9E-06	--	5.7E-04	--	5E-09	43%		--	--	
Metals																
Aluminum	7429-90-5	20000	N/A	N/A	N/A	1.5E-02	--	1.7E-04	--	5.0E-03	--	--		0.000034	21%	
Arsenic	7440-38-2	6.5	N/A	N/A	N/A	4.9E-06	2.1E-08	5.5E-08	4.3E-03	1.5E-05	9E-11	0.7%		0.0000037	2%	
Cadmium	7440-43-9	120	N/A	N/A	N/A	9.1E-05	--	1.0E-06	1.8E-03	1.0E-05	--	--		0.0001019	64%	
Cobalt	7440-48-4	12	N/A	N/A	N/A	9.1E-06	--	1.0E-07	9.0E-03	6.0E-06	--	--		0.0000170	11%	
Copper	7440-50-8	850	N/A	N/A	N/A	6.5E-04	--	--	--	--	--	--		--	--	
Manganese	7439-96-5	640	N/A	N/A	N/A	--	--	--	--	5.0E-05	--	--		--	--	
Mercury	7487-94-7	3.6	N/A	N/A	N/A	2.7E-06		3.1E-08	--	3.0E-04	--	--		0.00000010	0%	
Silver	7440-22-4	24	N/A	N/A	N/A	--	--	--	--	--	--	--		--	--	
Thallium	7440-28-0	0.27	N/A	N/A	N/A	2.1E-07	--	2.3E-09	--	--	--	--		--	--	
Vanadium	7440-62-2	31	N/A	N/A	N/A	2.4E-05	--	2.6E-07	--	1.0E-04	--	--		0.0000026	1.653%	
											Cancer Risk			**Hazard Index**		
										Pathway Sums:	1E-08	100%		0.000159	100%	
Chromium [14]																
Chromium (III)	16065-83-1	51	N/A	N/A	N/A	--	--	--	--	--	--	--		--	--	
Chromium (VI)	18540-29-9	51	N/A	N/A	N/A	3.9E-05	1.6E-07	4.3E-07	8.4E-02	1.0E-04	1E-08	53%	(15)	0.0000043	2.6%	(16)
											Cancer Risk			**Hazard Index**		
										Pathway Sums (including Chromium(III)):	1E-08	--		0.00016	--	
										Pathway Sums (including Chromium (VI)):	3E-08	--		0.00016	--	

Table B.1.12

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Open Detonation Hill Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

(4) mg/kg = milligram per kilogram

(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.

(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) µg/m^3 = micrograms per cubic meter.

(10) IUR is the inhalation unit risk.   IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.

(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

B.2 Combined Surface and Subsurface Soil Risk Characterization Calculations For OD Hill Area

B.2.1 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates – Incidental Ingestion of Surface Soil (0-≤15')
B.2.2 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates - Dermal Contact with Surface Soil (0-≤15')
B.2.3 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates - Inhalation of Volatiles/Fugitive Dust from Surface Soil (0-≤15')
B.2.4 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Incidental Ingestion of Surface Soil (0-≤15')
B.2.5 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Dermal Contact with Surface Soil (0-≤15')
B.2.6 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Inhalation of Volatiles/Fugitive Dust from Surface Soil (0-≤15')

Table B.2.1

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')

Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Incidental Soil Ingestion Rate, child (IRS_c)	200	mg/day
Age-adjusted soil ingestion factor (IFS_{adj})	105	(mg-year)/(kg-day)
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic analytes the intake is calculated as:

$$Intake = \frac{(C_s)(IFS_{adj})(EF)(CF)}{(AT)(365\ day / year)}$$

where: $$IFS_{adj} = \frac{(ED_c)(IRS_c)}{(BW_c)} + \frac{(ED_a)(IRS_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$Intake_{child} = \frac{(C_s)(IRS_c)(EF)(ED_c)(CF)}{(BW_c)(AT_{child})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC(1)	CAS Number(2)	Exposure Point Concentration (3) (mg/kg) (4)	Carcinogenic Intake (mg/kg-day) (5)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SFo (6) $(mg/kg\text{-}day)^{-1}$ (7)	RfDo (8) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds													
2,4-Dinitrotoluene	121-14-2	4.1	5.8E-06	5.2E-05	4.9E-06	3.1E-01	2.0E-03	1.8E-06	4.6%	0.026	0.566%	0.00244	0.566%
2,6-Dinitrotoluene	606-20-2	0.70	1.0E-06	8.9E-06	8.4E-07	1.5E+00	3.0E-04	1.5E-06	3.8%	0.0298	0.65%	0.0028	0.65%
Benzo(a)pyrene	50-32-8	0.050	7.2E-08	--	--	7.3E+00	--	5.3E-07	1.3%	--	--	--	--
Benzo(ghi)perylene	191-24-2	0.055	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	1.6	2.3E-06	--	--	7.0E+00	--	1.6E-05	41%	--	--	--	--
Phenanthrene	85-01-8	0.039	--	--	--	--	--	--	--	--	--	--	--
Explosives								--	--	--	--	--	--
Nitroglycerine	55-63-0	1.5	2.2E-06	1.9E-05	1.8E-06	1.7E-02	1.0E-04	3.7E-08	0.09%	0.19	4.2%	0.018	4.2%
Pesticides/PCB													
Aroclor-1254	11097-69-1	2.0	2.9E-06	2.6E-05	2.4E-06	2.0E+00	2.0E-05	5.8E-06	15%	1.28	28%	0.12	28%
Metals													
Aluminum	7429-90-5	19000	--	2.4E-01	2.3E-02	--	1.0E+00	--	--	0.24	5.3%	0.023	5.3%
Antimony	7440-36-0	0.72	--	9.2E-06	8.6E-07	--	4.0E-04			0.02	0.5%	0.002	0.5%
Arsenic	7440-38-2	6.3	9.1E-06	8.1E-05	7.6E-06	1.5E+00	3.0E-04	1.4E-05	35%	0.27	5.9%	0.025	5.9%
Cadmium	7440-43-9	92	--	1.2E-03	1.1E-04	--	1.0E-03	--	--	1.18	26%	0.11	26%
Cobalt	7440-48-4	12	--	1.5E-04	1.4E-05	--	3.0E-04	--	--	0.51	11.1%	0.048	11.1%
Copper	7440-50-8	1000	--	1.3E-02	1.2E-03	--	4.0E-02	--	--	0.32	7.0%	0.030	7.0%
Manganese	7439-96-5	630	--	8.1E-03	7.6E-04	--	1.4E-01	--	--	0.058	1.3%	0.0054	1.3%
Mercury	7487-94-7	4.6	--	5.9E-05	5.5E-06	--	3.0E-04	--	--	0.20	4.3%	0.018	4.3%
Silver	7440-22-4	19	--	2.4E-04	2.3E-05	--	5.0E-03	--	--	0.049	1.1%	0.0046	1.1%
Thallium	7440-28-0	0.11	--	1.4E-06	1.3E-07	--	1.0E-05	--	--	0.14	3.1%	0.013	3.1%
Vanadium	7440-62-2	30	--	3.8E-04	3.6E-05	--	5.0E-03	--	--	0.077	1.7%	0.007	1.7%
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums:	3.9E-05	100%	5	100%	0.4	100%
Chromium (9)													
Chromium (III)	16065-83-1	44	--	5.6E-04	5.3E-05	--	1.5E+00	--	--	0.00037	0.0082% (10)	0.000035	0.0082% (10)
Chromium (VI)	18540-29-9	44	6.3E-05	5.6E-04	5.3E-05	5.0E-01	3.0E-03	3.2E-05	45% (11)	0.2	4% (12)	0.02	4% (12)
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	3.9E-05	--	4.59	--	0.43	--
							Pathway Sums (including Chromium (VI)):	7.1E-05	--	4.77	--	0.45	--

Table B.2.1

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')

Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Incidental Soil Ingestion Rate, child (IRS_c)	200	mg/day
Age-adjusted soil ingestion factor (IFS_{adj})	105	(mg-year)/(kg-day)
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic analytes the intake is calculated as:

$$Intake = \frac{(C_s)(IFS_{adj})(EF)(CF)}{(AT)(365\ day/year)}$$

where: $$IFS_{adj} = \frac{(ED_c)(IRS_c)}{(BW_c)} + \frac{(ED_a)(IRS_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$Intake_{child} = \frac{(C_s)(IRS_c)(EF)(ED_c)(CF)}{(BW_c)(AT_{child})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC(1)	CAS Number(2)	Exposure Point Concentration (3) (mg/kg) (4)	Carcinogenic Intake (mg/kg-day) (5)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SFo (6) $(mg/kg\text{-}day)^{-1}$ (7)	RfDo (8) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.

(4) mg/kg = milligram per kilogram

(5) mg/kg-day = milligram per kilogram-day.

(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(10) Percent increase in cumulative hazard due to chromium (III).

(11) Percent increase in cumulative risk due to chromium (VI).

(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.2.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')
Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (Ed_a)	20	yrs
Exposure Duration, child (Ed_c)	6	yrs
Event Frequency (EV)	1	event/day
Skin Surface Area, adult (SA_a)	6032	cm^2
Skin Surface Area, child (SA_c)	2690	cm^2
Age-adjusted dermal contact factor (SFS_{adj})	320.76	(mg-year)/(kg-day)
Dermal Adherence Factor, adult (AF_a)	0.07	mg/cm^2-day
Dermal Adherence Factor, child (AF_c)	0.2	mg/cm^2-day
Dermal Absorption Factor (ABS)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(C_s)(SFS_{adj})(ABS)(EF)(EV)(CF)}{(AT)(365\,days\,/\,year)}$$

where:

$$SFS_{adj} = \frac{(ED_c)(AF_c)(SA_c)}{(BW_c)} + \frac{(ED_a)(AF_a)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(C_s)(ED_c)(AF_c)(SA_c)(ABS)(EF)(EV)(CF)}{(BW_c)(AT_{child})(365\,days/\,year)}$$

$$DAD_{adult} = \frac{(C_s)(ED_a)(AF_a)(SA_a)(ABS)(EF)(EV)(CF)}{(BW_a)(AT_{adult})(365\,days/\,year)}$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD \,/\, Rf_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (mg/kg) [4]	ABS [5] (unitless)	GIABS [6] (unitless)	SFo [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfDo [9] (mg/kg-day) [10]	SF_d [11] $(mg/kg\text{-}day)^{-1}$	RfD_d [12] (mg/kg-day)	Carcinogenic DAD [13] (mg/kg-day)	Noncarcinogenic DAD - Child (mg/kg-day)	Noncarcinogenic DAD - Adult (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																	
2,4-Dinitrotoluene	121-14-2	4.1	0.102	1	3.1E-01	2.0E-03	3.1E-01	2.0E-03	1.8E-06	1.4E-05	2.1E-06	5.6E-07	5.7%	0.00713	1.0%	0.00105	1.02%
2,6-Dinitrotoluene	606-20-2	0.70	0.099	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	3.0E-07	2.4E-06	3.5E-07	4.6E-07	4.6%	0.00794	1.1%	0.00117	1.1%
Benzo(a)pyrene	50-32-8	0.050	0.13	1	7.3E+00		7.3E+00	--	2.9E-08	--	--	2.1E-07	2.1%	--	--	--	--
Benzo(ghi)perylene	191-24-2	0.055	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	1.6	0.1	1	7.0E+00	--	7.0E+00	--	7.0E-07	--	--	4.9E-06	50%	--	--	--	--
Phenanthrene	85-01-8	0.039	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Explosives																	
Nitroglycerine	55-63-0	1.5	0.1	1	1.7E-02	1.0E-04	1.7E-02	1.0E-04	6.6E-07	5.2E-06	7.6E-07	1.1E-08	0.11%	0.05	7.4%	0.0076	7.4%
Pesticides/PCB																	
Aroclor-1254	11097-69-1	2	0.14	1	2.0E+00	2.0E-05	2.0E+00	2.0E-05	1.2E-06	9.6E-06	1.4E-06	2.5E-06	25%	0.48	69%	0.071	69%
Metals																	
Aluminum	7429-90-5	19000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--	--	--
Antimony	7440-36-0	0.72	--	0.15	--	4.0E-04	--	6.0E-05	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	3.0E-02	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	8.3E-07	6.5E-06	9.6E-07	1.2E-06	13%	0.02	3.1%	0.003	3.1%
Cadmium	7440-43-9	92	0.001	0.025	--	1.0E-03	--	2.5E-05	--	3.2E-06	4.7E-07	--	--	0.13	18%	0.019	18.2%
Cobalt	7440-48-4	12	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--	--	--
Copper	7440-50-8	1000	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	630	--	0.04	--	1.4E-01	--	5.6E-03	--	--	--	--	--	--	--	--	--
Mercury	7487-94-7	4.6	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--	--	--	--
Silver	7440-22-4	19	--	0.04	--	5.0E-03	--	2.0E-04	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	0.11	--	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	30	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums:	9.9E-06	100%	0.70	100%	0.10	100%
Chromium [14]																	
Chromium (III)	16065-83-1	44	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	44	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	1E-05	--	0.70	--	0.10	--
											Pathway Sums (including Chromium (VI)):	9.9E-06	--	0.70	--	0.10	--

Table B.2.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')
Open Detonation Hill Area - Former Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.

(4) mg/kg = milligram per kilogram

(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).

(6) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) mg/kg-day = milligram per kilogram-day.

(11) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(12) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(13) DAD = Dermally absorbed dose.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

Table B.2.3
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')
Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC in air (C_a)	chemical-specific	$\mu g/m^3$
COPC in surface soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	350	days/yr
Exposure Duration (ED)	26	yrs
Fraction of EF breathing air at site (ET)	1	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	26	yrs
Inhalation Unit Risk (IUR)	chemical-specific	$(\mu g/m^3)^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000\mu g/mg)\left(\frac{1}{VF} + \frac{1}{PEF}\right)$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000\mu g/mg)\left(\frac{1}{PEF}\right) + (C_{sat})(1000\mu g/mg)\left(\frac{1}{VF}\right)$$

where, for inorganics: $$C_a = (C_s)(1000\ \mu g/mg)\left(\frac{1}{PEF}\right)$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration [3] (mg/kg) [4]	C_{sat} [5] (mg/kg)	Is EPC ≤ C_{sat} [6]?	Volatilization Factor [7] (m^3/kg) [8]	C_a ($\mu g/m^3$) [9]	Carcinogenic EC(air) ($\mu g/m^3$)	Noncarcinogenic EC(air) ($\mu g/m^3$)	IUR [10] $(\mu g/m^3)^{-1}$ [11]	RfC [12] (mg/m^3) [13]	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
2,4-Dinitrotoluene	121-14-2	4.1	1.5E+02	Yes	4.6E+05	8.8E-03	3.1E-03	--	8.9E-05	--	3E-07	3.2%	--	--
2,6-Dinitrotoluene	606-20-2	0.70	1.0E+02	Yes	1.6E+04	4.4E-02	1.6E-02	--	--	--	--	--	--	--
Benzo(a)pyrene	50-32-8	0.050	1.0E+01	Yes	3.2E+07	1.6E-06	5.7E-07	--	1.1E-03	--	6E-10	0.01%	--	--
Benzo(ghi)perylene	191-24-2	0.055	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	1.6	1.4E+03	Yes	1.4E+05	1.1E-02	3.9E-03	--	2.0E-03	--	8E-06	91%	--	--
Phenanthrene	85-01-8	0.039	--	--	--	--	--	--	--	--	--	--	--	--
Explosives														
Nitroglycerine	55-63-0	1.5	9.6E+02	Yes	6.3E+05	2.4E-03	--	--	--	--	--	--	--	--
Pesticides/PCB														
Aroclor-1254	11097-69-1	2.0	3.4E+01	Yes	9.3E+05	2.2E-03	7.7E-04	--	5.7E-04	--	4E-07	5%	--	--
Metals														
Aluminum	7429-90-5	19000	N/A	N/A	N/A	1.4E-02	--	1.4E-02	--	5.0E-03	--	--	0.003	14%
Antimony	7440-36-0	0.72	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Cadmium	7440-43-9	92	N/A	N/A	N/A	7.0E-05	2.5E-05	6.7E-05	1.8E-03	1.0E-05	4E-08	0.5%	0.007	33%
Cobalt	7440-48-4	12	N/A	N/A	N/A	9.1E-06	3.2E-06	8.7E-06	9.0E-03	6.0E-06	3E-08	0.3%	0.001	7%
Copper	7440-50-8	1000	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	630	N/A	N/A	N/A	4.8E-04	--	4.6E-04	--	5.0E-05	--	--	0.009	45%
Mercury	7487-94-7	4.6	N/A	N/A	N/A	3.5E-06	--	3.4E-06	--	3.0E-04	--	--	0.00001	0.05%
Silver	7440-22-4	19	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	0.11	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	30	N/A	N/A	N/A	2.3E-05	--	2.2E-05	--	1.0E-04	--	--	0.0002	1%
											Cancer Risk		**Hazard Index**	
										Pathway Sums:	8.7E-06	100%	0.02	100%
Chromium [14]														
Chromium (III)	16065-83-1	44	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	44	N/A	N/A	N/A	3.3E-05	1.2E-05	3.2E-05	8.4E-02	1.0E-04	1E-06	10% [15]	0.0003	1.6% [16]
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	8.7E-06		2.0E-02	
										Pathway Sums (including Chromium (VI)):	9.7E-06		2.1E-02	

Table B.2.3
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')
Open Detonation Hill Area - Former Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.
(4) mg/kg = milligram per kilogram
(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.
(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.
(7) See Table B.3.2 for the calculation of VF.
(8) m^3/kg = cubic meters per kilogram.
(9) µg/m^3 = micrograms per cubic meter.
(10) IUR is the inhalation unit risk. IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.
(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) mg/m^3 = milligrams per cubic meter.
(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(15) Percent increase in cumulative risk due to chromium (VI).
(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

Table B.2.4

HYPOTHETICAL FUTURE CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')

Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE CONSTRUCTION WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration, adult (ED_a)	1	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration [3] (mg/kg) [4]	Carcinogenic Intake (mg/kg-day) [5]	Noncarcinogenic Intake (mg/kg-day)	SFo [6] $(mg/kg\text{-}day)^{-1}$ [7]	RfDo [8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds										
2,4-Dinitrotoluene	121-14-2	4.1	6.0E-09	4.2E-07	3.1E-01	2.0E-03	1.8E-09	4.6%	0.00021	0.57%
2,6-Dinitrotoluene	606-20-2	0.70	1.0E-09	7.2E-08	1.5E+00	3.0E-04	1.5E-09	3.8%	0.00024	0.65%
Benzo(a)pyrene	50-32-8	0.050	7.3E-11	--	7.3E+00	--	5.4E-10	1.3%	--	--
Benzo(ghi)perylene	191-24-2	0.055	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	1.6	2.3E-09	1.6E-07	7.0E+00	--	1.6E-08	41%	--	--
Phenanthrene	85-01-8	0.039	--	--	--	--	--	--	--	--
Explosives										
Nitroglycerine	55-63-0	1.5	2.2E-09	1.5E-07	1.7E-02	1.0E-04	3.7E-11	0.093%	0.0015	4.2%
Pesticides/PCB										
Aroclor-1254	11097-69-1	2.0	2.9E-09	2.1E-07	2.0E+00	2.0E-05	5.9E-09	15%	0.010	28%
Metals										
Aluminum	7429-90-5	19000	2.8E-05	2.0E-03	--	1.0E+00	--	--	0.0020	5.3%
Antimony	7440-36-0	0.72	--	7.4E-08	--	4.0E-04	--	--	0.0002	0.5%
Arsenic	7440-38-2	6.3	9.2E-09	6.5E-07	1.5E+00	3.0E-04	1.4E-08	35%	0.0022	5.9%
Cadmium	7440-43-9	92	1.3E-07	9.4E-06	--	1.0E-03	--	--	0.009	26%
Cobalt	7440-48-4	12	--	1.2E-06	--	3.0E-04	--	--	0.0041	11.1%
Copper	7440-50-8	1000	1.5E-06	1.0E-04	--	4.0E-02	--	--	0.0026	7.0%
Manganese	7439-96-5	630	9.2E-07	6.5E-05	--	1.4E-01	--	--	0.00046	1.3%
Mercury	7487-94-7	4.6	6.8E-09	4.7E-07	--	3.0E-04	--	--	0.0016	4.3%
Silver	7440-22-4	19	2.8E-08	2.0E-06	--	5.0E-03	--	--	0.00039	1.06%
Thallium	7440-28-0	0.11	--	1.1E-08	--	1.0E-05	--	--	0.00113	3.1%
Vanadium	7440-62-2	30	4.4E-08	3.1E-06	--	5.0E-03	--	--	0.00062	1.7%
							Cancer Risk		**Hazard Index**	
						Pathway Sums	4E-08	100%	0.037	100%
Chromium [9]										
Chromium (III)	16065-83-1	44	--	4.5E-06	--	1.5E+00	--	--	0.0000030	0.0082% [10]
Chromium (VI)	18540-29-9	44	6.5E-08	4.5E-06	5.0E-01	3.0E-03	3.2E-08	45% [11]	0.0015	3.9% [12]
							Cancer Risk		**Hazard Index**	
						Pathway Sums (including Chromium(III)):	4E-08	--	0.037	--
						Pathway Sums (including Chromium (VI)):	7E-08	--	0.038	--

[1] COPC = Constituent of potential concern.

[2] CAS = Chemical Abstracts Service number.

[3] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.

[4] mg/kg = milligram per kilogram

[5] mg/kg-day = milligram per kilogram-day.

[6] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

[7] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

[8] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

[9] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

[10] Percent increase in cumulative hazard due to chromium (III).

[11] Percent increase in cumulative risk due to chromium (VI).

[12] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.2.5
HYPOTHETICAL FUTURE CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')
Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE CONSTRUCTION WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Event Frequency (EV)	1	events/ day
Skin Surface Area (SA_a)	3470	cm^2
Dermal Adherence Factor (AF_d)	0.12	mg/cm^2-day
Dermal Absorption Factor (ABS_d)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EF)(ED_a)(EV)(SA_a)}{(BW_a)(AT)(365 days / year)}$$

where: $$DA_{event} = (C_s)(AF_a)(ABS)(CF)$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (mg/kg) (4)	ABS (5) (unitless)	GIABS (6) (unitless)	SFo (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfDo (9) (mg/kg-day)	SF_d (10) $(mg/kg\text{-}day)^{-1}$	RfD_d (11) (mg/kg-day)	DA_{event} (mg/cm^2-event) (12)	Carcinogenic DAD (13) (mg/kg-day) (14)	Noncarcinogenic DAD (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds															
2,4-Dinitrotoluene	121-14-2	4.1	0.102	1	3.1E-01	2.0E-03	3.1E-01	2.0E-03	5.0E-08	2.5E-09	1.8E-07	7.9E-10	5.7%	0.000089	1.02%
2,6-Dinitrotoluene	606-20-2	0.70	0.099	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	8.3E-09	4.2E-10	3.0E-08	6.4E-10	5%	0.000099	1.1%
Benzo(a)pyrene	50-32-8	0.050	0.13	1	7.3E+00		7.3E+00		7.8E-10	4.0E-11	2.8E-09	2.9E-10	2.1%	--	--
Benzo(ghi)perylene	191-24-2	0.055	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	1.6	0.1	1	7.0E+00	--	7.0E+00	--	1.9E-08	9.8E-10	6.8E-08	6.8E-09	50%	--	--
Phenanthrene	85-01-8	0.039	--	--	--	--	--	--	--	--	--	--	--	--	--
Explosives															
Nitroglycerine	55-63-0	1.5	0.1	1	1.7E-02	1.0E-04	1.7E-02	1.0E-04	1.8E-08	9.2E-10	6.4E-08	1.6E-11	0.11%	0.00064	7.4%
Pesticides/PCB															
Aroclor-1254	11097-69-1	2.0	0.14	1	2.0E+00	2.0E-05	2.0E+00	2.0E-05	3.4E-08	1.7E-09	1.2E-07	3.4E-09	25%	0.0060	69%
Metals															
Aluminum	7429-90-5	19000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--
Antimony	7440-36-0	0.72	--	0.15	--	4.0E-04	--	6.0E-05	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	3.0E-02	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.3E-08	1.2E-09	8.1E-08	1.7E-09	13%	0.0003	3%
Cadmium	7440-43-9	92	0.001	0.025	--	1.0E-03	--	2.5E-05	1.1E-08	--	3.9E-08	--	--	0.0016	18%
Cobalt	7440-48-4	12	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--
Copper	7440-50-8	1000	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--	--
Manganese	7439-96-5	630	--	0.04	--	1.4E-01	--	5.6E-03	--	--	--	--	--	--	--
Mercury	7487-94-7	4.6	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--	--
Silver	7440-22-4	19	--	0.04	--	5.0E-03	--	2.0E-04	--	--	--	--	--	--	--
Thallium	7440-28-0	0.11	--	1	--	1.0E-05	--	1.0E-05							
Vanadium	7440-62-2	30	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums:	1.4E-08	100%	0.0087	100%
Chromium (15)															
Chromium (III)	16065-83-1	44	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	44	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	1.4E-08		0.0087	
											Pathway Sums (including Chromium (VI)):	1.4E-08		0.0087	

Table B.2.5
HYPOTHETICAL FUTURE CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')
Open Detonation Hill Area - Former Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.
(4) mg/kg = milligram per kilogram
(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).
(6) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(11) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(12) mg/cm^2-event = milligram per squared centimeter per event.
(13) DAD = Dermally absorbed dose.
(14) mg/kg-day = milligram per kilogram-day.
(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.

Table B.2.6

HYPOTHETICAL FUTURE CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')

Open Detonation Hill Area - Former Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE CONSTRUCTION WORKER	
COPC in soil (C_s)	chemical-specific	mg/kg
COPC in air (C_a)	chemical-specific	$\mu g/m^3$
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Fraction of EF breathing air at site (ET)	0.333	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Inhalation Unit Risk (IUR)	chemical-specific	$(\mu g/m^3)^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000 \mu g/mg)\left(\frac{1}{VF} + \frac{1}{PEF}\right)$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000 \mu g/mg)\left(\frac{1}{PEF}\right) + (C_{sat})(1000 \mu g/mg)\left(\frac{1}{VF}\right)$$

where, for inorganics: $$C_a = (C_s)(1000\ \mu g/mg)\left(\frac{1}{PEF}\right)$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration [3] (mg/kg) [4]	C_{sat} [5] (mg/kg)	Is EPC ≤ C_{sat} [6]?	Volatilization Factor [7] (m^3/kg) [8]	C_a ($\mu g/m^3$) [9]	Carcinogenic EC(air) ($\mu g/m^3$)	Noncarcinogenic EC(air) ($\mu g/m^3$)	IUR [10] $(\mu g/m^3)^{-1}$ [11]	RfC [12] (mg/m^3) [13]	Cancer Risk	% of Total		Hazard Quotient	% of Total	
Semivolatile Organic Compounds																
2,4-Dinitrotoluene	121-14-2	4.1	1.5E+02	Yes	4.6E+05	8.8E-03	3.4E-06	--	8.9E-05	--	3.1E-10	3.2%		--	--	
2,6-Dinitrotoluene	606-20-2	0.70	1.0E+02	Yes	1.6E+04	4.4E-02	--	--	--	--	--	--		--	--	
Benzo(a)pyrene	50-32-8	0.050	1.0E+01	Yes	3.2E+07	1.6E-06	6.3E-10	--	1.1E-03	--	6.9E-13	0.01%		--	--	
Benzo(ghi)perylene	191-24-2	0.055	--	--	--	--	--	--	--	--	--	--		--	--	
N-Nitrosodipropylamine	621-64-7	1.6	1.4E+03	Yes	1.4E+05	1.1E-02	4.3E-06	--	2.0E-03	--	8.7E-09	91%		--	--	
Phenanthrene	85-01-8	0.039	--	--	--	--	--	--	--	--	--	--		--	--	
Explosives																
Nitroglycerine	55-63-0	1.5	9.6E+02	Yes	6.3E+05	--	--	--	--	--	--	--		--	--	
Pesticides/PCB																
Aroclor-1254	11097-69-1	2.0	3.4E+01	Yes	9.3E+05	2.2E-03	8.4E-07	--	5.7E-04	--	4.8E-10	5%		--	--	
Metals																
Aluminum	7429-90-5	19000	N/A	N/A	N/A	1.4E-02	--	4.0E-04	--	5.0E-03	--	--		0.00008	14%	
Antimony	7440-36-0	0.72	N/A	N/A	N/A	5.5E-07	--	--	--	--	--	--		--	--	
Arsenic	7440-38-2	6.3	N/A	N/A	N/A	4.8E-06	--	--	--	--	--	--		--	--	
Cadmium	7440-43-9	92	N/A	N/A	N/A	7.0E-05	2.7E-08	1.9E-06	1.8E-03	1.0E-05	4.9E-11	0.5%		0.0002	33%	
Cobalt	7440-48-4	12	N/A	N/A	N/A	9.1E-06	--	2.5E-07	9.0E-03	6.0E-06	--	--		0.00004	7%	
Copper	7440-50-8	1000	N/A	N/A	N/A	7.6E-04	--	--	--	--	--	--		--	--	
Manganese	7439-96-5	630	N/A	N/A	N/A	4.8E-04	--	1.3E-05	--	5.0E-05	--	--		0.0003	45%	
Mercury	7487-94-7	4.6	N/A	N/A	N/A	3.5E-06	--	9.6E-08	--	3.0E-04	--	--		0.0000003	0.05%	
Silver	7440-22-4	19	N/A	N/A	N/A	1.4E-05	--	--	--	--	--	--		--	--	
Thallium	7440-28-0	0.11	N/A	N/A	N/A	8.4E-08	--	--	--	--	--	--		--	--	
Vanadium	7440-62-2	30	N/A	N/A	N/A	2.3E-05	--	6.2E-07	--	1.0E-04	--	--		0.000006	1%	
											Cancer Risk			**Hazard Index**		
										Pathway Sums:	9.5E-09	100%		0.0006	100%	
Chromium [14]																
Chromium (III)	16065-83-1	44	N/A	N/A	N/A	--	--	--	--	--	--	--		--	--	
Chromium (VI)	18540-29-9	44	N/A	N/A	N/A	3.3E-05	1.3E-08	9.1E-07	8.4E-02	1.0E-04	1.1E-09	10%	[15]	0.000009	1.6%	[16]
											Cancer Risk			**Hazard Index**		
										Pathway Sums (including Chromium(III)):	9.5E-09			0.00058		
										Pathway Sums (including Chromium (VI)):	1.1E-08			0.00059		

Table B.2.6

HYPOTHETICAL FUTURE CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM COMBINED SURFACE AND SUBSURFACE SOIL (0-≤15')

Open Detonation Hill Area - Former Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.10.
(4) mg/kg = milligram per kilogram
(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.
(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.
(7) See Table B.3.2 for the calculation of VF.
(8) m^3/kg = cubic meters per kilogram.
(9) $\mu g/m^3$ = micrograms per cubic meter.
(10) IUR is the inhalation unit risk. IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.
(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) mg/m^3 = milligrams per cubic meter.
(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(15) Percent increase in cumulative risk due to chromium (VI).
(16) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

B.3 Supporting Tables for Soil Risk Characterization Calculations (PEF, VF, Csat)

- B.3.1 Particulate Emission Factor
- B.3.2 Volatilization Factor
- B.3.3 Soil Saturation

Table B.3.1
PARTICULATE EMISSION FACTOR
Open Detonation Hill Area - Seneca Army Depot Activity

Parameters			Equation
Inverse of mean concentration at center of square source area (Q/C)	90.8	g/m^2-s per kg/m^3	$$PEF = Q/C \times \frac{3{,}600 s/hr}{0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x)}$$
Fraction of vegetative cover (V)	0.5	unitless	
Mean annual wind speed (U_m)	4.69	m/s	
Equivalent threshold value of wind speed at 7m (U_t)	11.32	m/s	
Function dependent on Um/Ut derived using Cowherd et al. 1985	0.194	unitless	
Particulate emission factor (PEF)	1.32E+09	m^3/kg	

References:

Cowherd et. Al 1985 as cited in U.S. Environmental Protection Agency (EPA). July 1996. Soil Screening Guidance: Users Guide. EPA540/R-96/018. Office of Emergency and Remedial Response. Washington, D.C. PB96-963505. July.

Table B.3.2
VOLATILIZATION FACTOR
Open Detonation Hill Area - Seneca Army Depot Activity

Parameters			
Inverse of mean concentration at center of square source area (Q/C)		90.8	g/m^2-s per kg/m^3
Apparent diffusivity (D_a)		chemical specific	cm^2 per s
Exposure Interval (T)		9.50E+08	s
Dry Soil Bulk Density (ρ_b)		1.50	g/cm^3
Air-filled Soil Porosity (θ_a)	$=n-\theta_w$	0.28	L_{air}/L_{soil}
Total Soil Porosity (n)	$=1-(\rho_b/\rho_s)$	0.43	L_{pore}/L_{soil}
Soil Particle Density (ρ_s)		2.65	g/cm^3
Water-filled Soil Porosity (θ_w)		0.15	L_{water}/L_{soil}
Diffusivity in Air (D_i)		Chemical-specific	cm^2/s
Henry's Law Constant (H')		Chemical-specific	unitless
Diffusivity in Water (D_w)		Chemical-specific	cm^2/s
Soil-water Partition Coefficient (K_d)	$=(K_{oc})(f_{oc})$	Chemical-specific	cm^3/g
Soil Organic Carbon-water Partition Coefficient (K_{OC})		Chemical-specific	cm^3/g
Organic Carbon Content of Soil (f_{OC})		0.006 (0.6%)	g/g

Equation

$$VF = Q/C \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4}\, m^2/cm^2$$

where:

$$D_A = \frac{\left[\left(\Theta_a^{10/3} \times D_i \times H' + \Theta_w^{10/3} \times D_w\right)/n^2\right]}{\rho_b \times K_d + \Theta_w + \Theta_a \times H'}$$

COPC[1]	CAS Number[2]	Diffusivity in Air (D_i) [3] (cm^2/s) [5]	Henry's Law Constant (H') [3] (unitless)	Diffusivity in Water (D_w) [3] (cm^2/s)	Soil-water Partition Coefficient (K_d) [4] (cm^3/g) [6]	Soil Organic Carbon-water Partition Coefficient (K_{OC}) [3] (cm^3/g)	D_a (cm^2/s)	Volatilization Factor (VF) (m^3/kg) [7]
Semivolatile Organic Compounds								
2,4-Dinitrotoluene	121-14-2	2.03E-01	3.80E-06	7.06E-06	5.73E-01	9.55E+01	1.3E-07	4.6E+05
2,6-Dinitrotoluene	606-20-2	3.27E+01	3.06E-05	7.26E-06	4.15E-01	6.92E+01	1.0E-04	1.6E+04
Benzo(a)pyrene	50-32-8	4.30E-02	4.63E-05	9.00E-06	6.12E+03	1.02E+06	2.7E-11	3.2E+07
Benzo(ghi)perylene	191-24-2	--	--	--	--	--	--	--
N-Nitrosodipropylamine	5.45E-02	5.45E-02	9.23E-05	8.17E-06	1.44E-01	2.40E+01	1.3E-06	1.4E+05
Phenanthrene	85-01-8	--	--	--	--	--	--	--
Herbicide								
MCPA	94-74-6	5.54E-02 [8]	5.44E-08 [8]	6.48E-06 [8]	1.78E-01	2.96E+01 [8]	1.5E-07	4.3E+05
Explosives								
Nitroglycerine	55-63-0	2.90E-02 [8]	3.54E-06 [8]	7.74E-06 [8]	6.95E-01	1.16E+02 [8]	6.9E-08	6.3E+05
Pesticides/PCB								
Aroclor-1254	11097-69-1	4.01E-02 [8]	1.16E-02 [8]	4.68E-06 [8]	7.83E+02	1.31E+05 [8]	3.2E-08	9.3E+05

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Value obtained from EPA Soil Screening Guidance: Users Guide, Attachment C (EPA, 1996; http://www.epa.gov/superfund/health/conmedia/soil/pdfs/attachc.pdf).
(4) K_d calucated as K_{OC} x foc
(5) cm^2/s = square centimeters per second
(6) cm^2/g = square centimeters per gram
(7) cm^2/g = square meters per kilogram
(8) Value not available from EPA Soil Screening Guidance: Users Guide, Attachment C. Value obtained from the EPA Regional Screening Level Chemical-specific Parameters Supporting Table, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/params_sl_table_run_MAY2014.pdf).
-- = toxicity data not available.

Table B.3.3
SOIL SATURATION
Open Detonation Hill Area - Seneca Army Depot Activity

Parameters				Equation
Soil saturation concentration (C_{sat})		Chemical-specific	mg/kg	$$C_{sat} = \frac{S}{\rho_b} \times K_d \times \rho_b + \Theta_w + H' \times \Theta_a$$
Solubility in water (S)		Chemical-specific	mg/L-water	
Dry Soil Bulk Density (ρ_b)		1.50	g/cm^3	
Soil Particle Density (ρ_s)		2.65	g/cm^3	
Air-filled Soil Porosity (θ_a)	$=n-\theta_w$	0.283962264	L_{air}/L_{soil}	
Total Soil Porosity (n)	$=1-(\rho_b/\rho_s)$	0.433962264	L_{pore}/L_{soil}	
Water-filled Soil Porosity (θ_w)		0.15	L_{water}/L_{soil}	
Henry's Law Constant (H')		Chemical-specific	unitless	
Soil-water Partition Coefficient (K_d)	$=(K_{oc})(f_{oc})$	Chemical-specific	cm^3/g	
Soil Organic Carbon-water Partition Coefficient (K_{OC})		Chemical-specific	cm^3/g	
Organic Carbon Content of Soil (f_{OC})		0.006 (0.6%)	g/g	

COPC[1]	CAS Number[2]	Solubility in water (S) [3] (mg/L-water) [5]	Henry's Law Constant (H') [3] (unitless)	Soil-water Partition Coefficient (K_d) [4] (cm^3/g) [6]	Soil Organic Carbon-water Partition Coefficient (K_{OC}) [3] (cm^3/g)	Soil Saturation Concentration (mg/kg) [7]
Semivolatile Organic Compounds						
2,4-Dinitrotoluene	121-14-2	2.70E+02	3.80E-06	5.7E-01	9.55E+01	1.5E+02
2,6-Dinitrotoluene	606-20-2	1.82E+02	3.06E-05	5.7E-01	9.55E+01	1.0E+02
Benzo(a)pyrene	50-32-8	1.62E-03	4.63E-05	6.1E+03	1.02E+06	1.0E+01
Benzo(ghi)perylene	191-24-2	--	--	--	--	--
N-Nitrosodipropylamine	621-64-7	9.89E+03	9.23E-05	1.4E-01	2.40E+01	1.4E+03
Phenanthrene	85-01-8	--	--	--	--	--
Herbicide						
MCPA	94-74-6	6.30E+02 [8]	5.44E-08 [8]	1.8E-01	2.96E+01 [8]	1.1E+02
Explosives						
Nitroglycerine	55-63-0	1.38E+03 [8]	3.54E-06 [8]	6.9E-01	1.16E+02 [8]	9.6E+02
Pesticides/PCB						
Aroclor-1254	11097-69-1	4.30E-02 [8]	1.16E-02 [8]	7.8E+02	1.31E+05 [8]	3.4E+01

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.

(3) Value obtained from EPA Soil Screening Guidance: Users Guide, Attachment C (EPA, 1996; http://www.epa.gov/superfund/health/conmedia/soil/pdfs/attachc.pdf).

(4) mg/L = milligram per Liter.
(5) K_d calucated as K_{OC} x foc
(6) cm^2/g = square centimeters per gram
(7) mg/kg = milligram per kilogram.

(8) Value not available from EPA Soil Screening Guidance: Users Guide, Attachment C. Value obtained from the EPA Regional Screening Level Chemical-specific Parameters Supporting Table, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/params_sl_table_run_MAY2014.pdf).

-- = toxicity data not available.

B.4 Groundwater Risk Characterization Calculations

- B.4.1 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Groundwater - All Wells
- B.4.2 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater - All Wells
- B.4.3 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Groundwater - All Wells
- B.4.4 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater - All Wells
- B.4.5 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Groundwater - All Wells
- B.4.6 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater - All Wells
- B.4.7 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Groundwater - All Wells
- B.4.8 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater - All Wells
- B.4.9 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Groundwater MW 1
- B.4.10 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 1
- B.4.11 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Groundwater MW 1
- B.4.12 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 1
- B.4.13 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Groundwater MW 1
- B.4.14 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 1
- B.4.15 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Groundwater MW 1
- B.4.16 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 1
- B.4.17 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Groundwater MW 2
- B.4.18 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 2
- B.4.19 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Groundwater MW 2
- B.4.20 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 2
- B.4.21 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Groundwater MW 2
- B.4.22 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 2
- B.4.23 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Groundwater MW 2
- B.4.24 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Groundwater MW 2

Table B.4.1
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds														
Bis(2-Ethylhexyl)phthalate	117-81-7	33	0.033	4.2E-04	1.6E-03	9.9E-04	1.4E-02	2.0E-02	5.9E-06	3%	0.082	0.15%	0.049	0.15%
Metals														
Aluminum	7429-90-5	63300	63	--	3.2E+00	1.9E+00	--	1.0E+00	--	--	3.2	5.6%	1.9	5.6%
Antimony	7440-36-0	52.1 J	0.052	--	2.6E-03	1.6E-03	--	4.0E-04	--	--	6.5	12%	3.9	12%
Arsenic	7440-38-2	9.5 J	0.0095	1.2E-04	4.7E-04	2.8E-04	1.5E+00	3.0E-04	1.8E-04	97%	1.6	2.8%	0.95	2.8%
Barium	7440-39-3	751	0.75	--	3.7E-02	2.3E-02	--	2.0E-01	--	--	0.19	0.33%	0.11	0.33%
Beryllium	7440-41-7	5	0.0050	--	2.5E-04	1.5E-04	--	2.0E-03	--	--	0.12	0.22%	0.075	0.22%
Cadmium	7440-43-9	3.8 J	0.0038	--	1.9E-04	1.1E-04	--	5.0E-04	--	--	0.38	0.67%	0.23	0.67%
Cobalt	7440-48-4	94.4	0.094	--	4.7E-03	2.8E-03	--	3.0E-04	--	--	16	28%	9.4	28%
Copper	7440-50-8	123	0.12	--	6.1E-03	3.7E-03	--	4.0E-02	--	--	0.15	0.27%	0.092	0.27%
Manganese (non-diet)	7439-96-5	4640	4.6	--	2.3E-01	1.4E-01	--	2.4E-02	--	--	9.6	17%	5.8	17%
Mercury	7487-94-7	1.8	0.0018	--	9.0E-05	5.4E-05	--	3.0E-04	--	--	0.30	0.53%	0.18	0.53%
Nickel	7440-02-0	209	0.21	--	1.0E-02	6.3E-03	--	2.0E-02	--	--	0.52	0.93%	0.313	0.93%
Thallium	7440-28-0	3.4 J	0.0034	--	1.7E-04	1.0E-04	--	1.0E-05	--	--	17	30%	10	30%
Vanadium	7440-62-2	93.1	0.093	--	4.6E-03	2.8E-03	--	5.0E-03	--	--	0.93	1.7%	0.56	1.7%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	1.9E-04	100%	56	100%	34	100%
Chromium [10]														
Chromium (III)	16065-83-1	106	0.11	--	5.3E-03	3.2E-03	--	1.5E+00	--	--	0.0035	0.0063% [11]	0.0021	0.0063% [11]
Chromium (VI)	18540-29-9	106	0.11	1.4E-03	5.3E-03	3.2E-03	5.0E-01	3.0E-03	6.8E-04	78% [12]	1.8	3.0% [13]	1.1	3.0% [13]
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	1.9E-04	--	56		34	
								Pathway Sums (including Chromium (VI)):	8.7E-04	--	58		35	

Table B.4.1

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

Table B.4.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event\text{- adjusted}} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	33	0.000033	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	63300	0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	4.2E-05	--	1.7E-02	1.1E-02	1	--	1.0E+00	--	1.0E+00	--	--	0.017	0.82%	0.011	0.82%
Antimony	7440-36-0	52.1 J	0.000052	0.0010	1.21	N/A	1.0	0.51	0.0042	3.5E-08	--	1.4E-05	8.8E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.24	11%	0.15	11%
Arsenic	7440-38-2	9.5 J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	6.4E-09	6.8E-07	2.6E-06	1.6E-06	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.0E-06	100%	0.0087	0.41%	0.0053	0.41%
Barium	7440-39-3	751	0.00075	0.0010	1.48	N/A	1.0	0.62	0.0045	5.0E-07	--	2.1E-04	1.3E-04	0.07	--	2.0E-01	--	1.4E-02	--	--	0.015	0.70%	0.0090	0.70%
Beryllium	7440-41-7	5	0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	3.4E-09	--	1.4E-06	8.4E-07	0.007	--	2.0E-03	--	1.4E-05	--	--	0.098	4.6%	0.060	4.6%
Cadmium	7440-43-9	3.8 J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	2.5E-09	--	1.0E-06	6.4E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.042	2.0%	0.026	2.0%
Cobalt	7440-48-4	94.4	0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	2.5E-08	--	1.0E-05	6.3E-06	1	--	3.0E-04	--	3.0E-04	--	--	0.034	1.6%	0.021	1.6%
Copper	7440-50-8	123	0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	8.3E-08	--	3.4E-05	2.1E-05	1	--	4.0E-02	--	4.0E-02	--	--	0.001	0.040%	0.00052	0.040%
Manganese	7439-96-5	4640	0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	3.1E-06	--	1.3E-03	7.8E-04	0.04	--	2.4E-02	--	9.6E-04	--	--	1.3	63%	0.81	63%
Mercury	7487-94-7	1.8	0.0000018	0.0010	8.36	N/A	1.0	3.49	0.0063	1.2E-09	--	4.9E-07	3.0E-07	0.07	--	3.0E-04	--	2.1E-05	--	--	0.023	1.1%	0.014	1.1%
Nickel	7440-02-0	209	0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	2.8E-08	--	1.1E-05	7.0E-06	0.04	--	2.0E-02	--	8.0E-04	--	--	0.014	0.68%	0.0088	0.68%
Thallium	7440-28-0	3.4 J	0.0000034	0.0010	3.52	N/A	1.0	1.47	0.0055	2.3E-09	--	9.3E-07	5.7E-07	1	--	1.0E-05	--	1.0E-05	--	--	0.093	4.4%	0.057	4.4%
Vanadium	7440-62-2	93.1	0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	6.2E-08	--	2.5E-05	1.6E-05	0.026	--	5.0E-03	--	1.3E-04	--	--	0.20	9.3%	0.12	9.3%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.0E-06	100%	2	100%	1	100%
Chromium [19]																								
Chromium (III)	16065-83-1	106	0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	7.1E-08	--	2.9E-05	1.8E-05	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0015	0.071% [20]	0.00091	0.071% [20]
Chromium (VI)	18540-29-9	106	0.00011	0.0020	0.49	N/A	1.0	0.21	0.0055	1.4E-07	1.5E-05	5.8E-05	3.6E-05	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	3.0E-04	100% [21]	0.77	27% [22]	0.47	27% [22]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	1E-06	--	2	--	1	--
																		Pathway Sums (including Chromium (VI)):	3.0E-04	--	3	--	2	--

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.

Table B.4.3
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	3.9E-08	2.7E-06	1.4E-02	2.0E-02	5.4E-10	3.1%	0.00014	0.15%
Metals												
Aluminum	7429-90-5	63300		63	--	5.2E-03	--	1.0E+00	--	--	0.0052	5.6%
Antimony	7440-36-0	52.1	J	0.052	--	4.3E-06	--	4.0E-04	--	--	0.011	12%
Arsenic	7440-38-2	9.5	J	0.0095	1.1E-08	7.8E-07	1.5E+00	3.0E-04	1.7E-08	97%	0.0026	2.8%
Barium	7440-39-3	751		0.75	--	6.2E-05	--	2.0E-01	--	--	0.00031	0.33%
Beryllium	7440-41-7	5		0.0050	--	4.1E-07	--	2.0E-03	--	--	0.00021	0.22%
Cadmium	7440-43-9	3.8	J	0.0038	--	3.1E-07	--	5.0E-04	--	--	0.00062	0.67%
Cobalt	7440-48-4	94.4		0.094	--	7.8E-06	--	3.0E-04	--	--	0.026	28%
Copper	7440-50-8	123		0.12	--	1.0E-05	--	4.0E-02	--	--	0.00025	0.27%
Manganese	7439-96-5	4640		4.6	--	3.8E-04	--	2.4E-02	--	--	0.016	17%
Mercury	7487-94-7	1.8		0.0018	--	1.5E-07	--	3.0E-04	--	--	0.00049	0.53%
Nickel	7440-02-0	209		0.21	--	1.7E-05	--	2.0E-02	--	--	0.00086	0.93%
Thallium	7440-28-0	3.4	J	0.0034	--	2.8E-07	--	1.0E-05	--	--	0.028	30%
Vanadium	7440-62-2	93.1		0.093	--	7.7E-06	--	5.0E-03	--	--	0.0015	1.7%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	1.7E-08	100%	0.09	100%
Chromium [10]												
Chromium (III)	16065-83-1	106		0.11	--	8.7E-06	--	1.5E+00	--	--	0.0000058	0.0063% [11]
Chromium (VI)	18540-29-9	106		0.11	1.2E-07	8.7E-06	5.0E-01	3.0E-03	6.2E-08	78% [12]	0.0029	3.0% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-08	--	0.09	--
								Pathway Sums (including Chromium (VI)):	8E-08	--	0.1	--

Table B.4.3

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

Table B.4.4
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	33	0.000033	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	63300	0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	1.3E-04	--	4.51E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00045	0.82%
Antimony	7440-36-0	52.1 J	0.000052	0.0010	1.2	N/A	1.0	0.51	0.0042	1.0E-07	--	3.71E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0062	11%
Arsenic	7440-38-2	9.5 J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	1.9E-08	9.7E-10	6.77E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.5E-09	100%	0.00023	0.41%
Barium	7440-39-3	751	0.00075	0.0010	1.5	N/A	1.0	0.62	0.0045	1.5E-06	--	5.35E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00038	0.70%
Beryllium	7440-41-7	5	0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	1.0E-08	--	3.57E-08	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0025	4.6%
Cadmium	7440-43-9	3.8 J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	7.6E-09	--	2.71E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0011	2.0%
Cobalt	7440-48-4	94.4	0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	7.6E-08	--	2.69E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.00090	1.6%
Copper	7440-50-8	123	0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	2.5E-07	--	8.77E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.000022	0.040%
Manganese	7439-96-5	4640	0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	9.3E-06	--	3.31E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.034	63%
Mercury	7487-94-7	1.8	0.0000018	0.0010	8.4	N/A	1.0	3.49	0.0063	3.6E-09	--	1.28E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00061	1.1%
Nickel	7440-02-0	209	0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	8.4E-08	--	2.98E-07	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00037	0.68%
Thallium	7440-28-0	3.4 J	0.0000034	0.0010	3.5	N/A	1.0	1.47	0.0055	6.8E-09	--	2.42E-08	1	--	1.0E-05	--	1.0E-05	--	--	0.0024	4.4%
Vanadium	7440-62-2	93.1	0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	1.9E-07	--	6.64E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0051	9.3%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	1E-09	100%	0.05	100%
Chromium (19)																					
Chromium (III)	16065-83-1	106	0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	2.1E-07	--	7.56E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00004	0.071% (20)
Chromium (VI)	18540-29-9	106	0.00011	0.0020	0.4934691	N/A	1.0	0.21	0.0055	4.2E-07	2.2E-08	0.0000015	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	4.3E-07	100% (21)	0.020	27% (22)
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	1E-09	--	0.05	--
																	Pathway Sums (including Chromium (VI)):	4E-07	--	0.07	--

Table B.4.4
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional

values obtained from USEPA Regional
Screening Levels (RSLs) for Chemical
Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor,
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.

Table B.4.5
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	2.3E-04	6.4E-04	1.4E-02	2.0E-02	3.2E-06	3.1%	0.032	0.15%
Metals												
Aluminum	7429-90-5	63300		63	--	1.2E+00	--	1.0E+00	--	--	1.2	5.6%
Antimony	7440-36-0	52.1	J	0.052	--	1.0E-03	--	4.0E-04	--	--	2.5	12%
Arsenic	7440-38-2	9.5	J	0.0095	6.5E-05	1.8E-04	1.5E+00	3.0E-04	9.8E-05	96.9%	0.61	2.8%
Barium	7440-39-3	751		0.75	--	1.4E-02	--	2.0E-01	--	--	0.072	0.33%
Beryllium	7440-41-7	5		0.0050	--	9.6E-05	--	2.0E-03	--	--	0.048	0.22%
Cadmium	7440-43-9	3.8	J	0.0038	--	7.3E-05	--	5.0E-04	--	--	0.15	0.67%
Cobalt	7440-48-4	94.4		0.094	--	1.8E-03	--	3.0E-04	--	--	6.1	28%
Copper	7440-50-8	123		0.12	--	2.4E-03	--	4.0E-02	--	--	0.059	0.27%
Manganese	7439-96-5	4640		4.6	--	8.9E-02	--	2.4E-02	--	--	3.7	17%
Mercury	7487-94-7	1.8		0.0018	--	3.5E-05	--	3.0E-04	--	--	0.12	0.53%
Nickel	7440-02-0	209		0.21	--	4.0E-03	--	2.0E-02	--	--	0.20	0.93%
Thallium	7440-28-0	3.4	J	0.0034	--	6.5E-05	--	1.0E-05	--	--	6.5	30%
Vanadium	7440-62-2	93.1		0.093	--	1.8E-03	--	5.0E-03	--	--	0.36	1.7%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	1.0E-04	100%	22	100%
Chromium [10]												
Chromium (III)	16065-83-1	106		0.11	--	2.0E-03	--	1.5E+00	--	--	0.0014	0.0063% [11]
Chromium (VI)	18540-29-9	106		0.11	7.3E-04	2.0E-03	5.0E-01	3.0E-03	3.6E-04	78% [12]	0.68	3.0% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	1E-04	--	22	--
								Pathway Sums (including Chromium (VI)):	5E-04	--	22	--

Table B.4.5

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

Table B.4.6

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD \ / \ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																						
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.000033	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																						
Aluminum	7429-90-5	63300		0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	6.3E-05	--	1.7E-03	1	--	1.0E+00	--	1.0E+00	--	--	0.0017	0.82%
Antimony	7440-36-0	52.1	J	0.000052	0.0010	1.21	N/A	1.0	0.51	0.0042	5.2E-08	--	1.4E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.023	11%
Arsenic	7440-38-2	9.5	J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	9.5E-09	9.1E-08	2.5E-07	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.4E-07	100%	0.00085	0.41%
Barium	7440-39-3	751		0.00075	0.0010	1.48	N/A	1.0	0.62	0.0045	7.5E-07	--	2.0E-05	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0014	0.70%
Beryllium	7440-41-7	5		0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	5.0E-09	--	1.3E-07	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0095	4.6%
Cadmium	7440-43-9	3.8	J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	3.8E-09	--	1.0E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0041	2.0%
Cobalt	7440-48-4	94.4		0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	3.8E-08	--	1.0E-06	1	--	3.0E-04	--	3.0E-04	--	--	0.0034	1.6%
Copper	7440-50-8	123		0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	1.2E-07	--	3.3E-06	1	--	4.0E-02	--	4.0E-02	--	--	0.000082	0.040%
Manganese	7439-96-5	4640		0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	4.6E-06	--	1.2E-04	0.04	--	2.4E-02	--	9.6E-04	--	--	0.13	63%
Mercury	7487-94-7	1.8		0.0000018	0.0010	8.36	N/A	1.0	3.49	0.0063	1.8E-09	--	4.8E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.0023	1.1%
Nickel	7440-02-0	209		0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	4.2E-08	--	1.1E-06	0.04	--	2.0E-02	--	8.0E-04	--	--	0.0014	0.68%
Thallium	7440-28-0	3.4	J	0.0000034	0.0010	3.52	N/A	1.0	1.47	0.0055	3.4E-09	--	9.1E-08	1	--	1.0E-05	--	1.0E-05	--	--	0.0091	4.4%
Vanadium	7440-62-2	93.1		0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	9.3E-08	--	2.5E-06	0.026	--	5.0E-03	--	1.3E-04	--	--	0.019	9.3%
																			Cancer Risk		**Hazard Index**	
																		Pathway sums:	1E-07	100%	0.2	100%
Chromium [19]																						
Chromium (III)	16065-83-1	106		0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	1.1E-07	--	2.8E-06	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00015	0.032% [20]
Chromium (VI)	18540-29-9	106		0.00011	0.0020	0.49	N/A	1.0	0.21	0.0055	2.1E-07	2.0E-06	5.7E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	4.0E-05	100% [21]	0.076	16% [22]
																			Cancer Risk		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	1E-07	--	0.5	--
																		Pathway Sums (including Chromium (VI)):	4E-05	--	0.5	--

Table B.4.6
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional
values obtained from USEPA Regional
Screening Levels (RSLs) for Chemical
Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.

Table B.4.7

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	2.9E-05	1.1E-04	6.8E-05	1.4E-02	2.0E-02	4.1E-07	3.1%	0.0056	0.15%	0.0034	0.15%
Metals															
Aluminum	7429-90-5	63300		63	--	2.2E-01	1.3E-01	--	1.0E+00	--	--	0.22	5.6%	0.13	5.6%
Antimony	7440-36-0	52.1	J	0.052	--	1.8E-04	1.1E-04	--	4.0E-04	--	--	0.45	12%	0.27	12%
Arsenic	7440-38-2	9.5	J	0.0095	8.4E-06	3.2E-05	2.0E-05	1.5E+00	3.0E-04	1.3E-05	97%	0.11	2.8%	0.065	2.8%
Barium	7440-39-3	751		0.75	--	2.6E-03	1.5E-03	--	2.0E-01	--	--	0.013	0.33%	0.0077	0.33%
Beryllium	7440-41-7	5		0.0050	--	1.7E-05	1.0E-05	--	2.0E-03	--	--	0.0085	0.22%	0.0051	0.22%
Cadmium	7440-43-9	3.8	J	0.0038	--	1.3E-05	7.8E-06	--	5.0E-04	--	--	0.026	0.67%	0.016	0.67%
Cobalt	7440-48-4	94.4		0.094	--	3.2E-04	1.9E-04	--	3.0E-04	--	--	1.1	28%	0.65	28%
Copper	7440-50-8	123		0.12	--	4.2E-04	2.5E-04	--	4.0E-02	--	--	0.011	0.27%	0.0063	0.27%
Manganese	7439-96-5	4640		4.6	--	1.6E-02	9.5E-03	--	2.4E-02	--	--	0.66	17%	0.40	17%
Mercury	7487-94-7	1.8		0.0018	--	6.2E-06	3.7E-06	--	3.0E-04	--	--	0.021	0.53%	0.012	0.53%
Nickel	7440-02-0	209		0.21	--	7.1E-04	4.3E-04	--	2.0E-02	--	--	0.036	0.93%	0.021	0.93%
Thallium	7440-28-0	3.4	J	0.0034	--	1.2E-05	7.0E-06	--	1.0E-05	--	--	1.2	30%	0.70	30%
Vanadium	7440-62-2	93.1		0.093	--	3.2E-04	1.9E-04	--	5.0E-03	--	--	0.064	1.7%	0.038	1.7%
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	1.3E-05	100%	4	100%	2	100%
Chromium (10)															
Chromium (III)	16065-83-1	106		0.11	--	3.6E-04	2.2E-04	--	1.5E+00	--	--	0.00024	0.0063% (11)	0.00015	0.0063% (11)
Chromium (VI)	18540-29-9	106		0.11	9.3E-05	3.6E-04	2.2E-04	5.0E-01	3.0E-03	4.7E-05	78% (12)	0.12	3.0% (13)	0.073	3.0% (13)
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	1E-05		4		2	
									Pathway Sums:	6E-05		4		2	

Table B.4.7
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.

Table B.4.8

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2\,FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.000033	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	63300		0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	4.2E-05	--	1.8E-04	7.8E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.00018	0.82%	0.000078	0.82%
Antimony	7440-36-0	52.1	J	0.000052	0.0010	1.21	N/A	1.0	0.51	0.0042	3.5E-08	--	1.5E-07	6.4E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0025	11%	0.0011	11%
Arsenic	7440-38-2	9.5	J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	6.4E-09	5.7E-09	2.7E-08	1.2E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	8.5E-09	100%	0.000090	0.41%	0.000039	0.41%
Barium	7440-39-3	751		0.00075	0.0010	1.48	N/A	1.0	0.62	0.0045	5.0E-07	--	2.1E-06	9.2E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00015	0.70%	0.000066	0.70%
Beryllium	7440-41-7	5		0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	3.4E-09	--	1.4E-08	6.1E-09	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0010	4.6%	0.00044	4.6%
Cadmium	7440-43-9	3.8	J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	2.5E-09	--	1.1E-08	4.7E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00043	2.0%	0.00019	2.0%
Cobalt	7440-48-4	94.4		0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	2.5E-08	--	1.1E-07	4.6E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.00036	1.6%	0.00015	1.6%
Copper	7440-50-8	123		0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	8.3E-08	--	3.5E-07	1.5E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.0000088	0.040%	0.0000038	0.040%
Manganese	7439-96-5	4640		0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	3.1E-06	--	1.3E-05	5.7E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.014	63%	0.0059	63%
Mercury	7487-94-7	1.8		0.0000018	0.0010	8.36	N/A	1.0	3.49	0.0063	1.2E-09	--	5.1E-09	2.2E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00024	1.1%	0.00011	1.1%
Nickel	7440-02-0	209		0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	2.8E-08	--	1.2E-07	5.1E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00015	0.68%	0.000064	0.68%
Thallium	7440-28-0	3.4	J	0.0000034	0.0010	3.52	N/A	1.0	1.47	0.0055	2.3E-09	--	9.7E-09	4.2E-09	1	--	1.0E-05	--	1.0E-05	--	--	0.0010	4.4%	0.00042	4.4%
Vanadium	7440-62-2	93.1		0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	6.2E-08	--	2.7E-07	1.1E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0020	9.3%	0.00088	9.3%
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	8E-09	100%	0.02	100%	0.009	100%
Chromium [19]																									
Chromium (III)	16065-83-1	106		0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	7.1E-08	--	3.0E-07	1.3E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000016	0.071% [20]	0.0000067	0.071% [20]
Chromium (VI)	18540-29-9	106		0.00011	0.0020	0.49	N/A	1.0	0.21	0.0055	1.4E-07	1.3E-07	6.0E-07	2.6E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	2.5E-06	100% [21]	0.0081	27% [22]	0.0035	27% [22]
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	8E-09		0.02		0.01	
																			Pathway Sums (including Chromium (VI)):	3E-06		0.03		0.01	

Table B.4.8

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for All Wells within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for all wells combined. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
(13) SFo is the oral cancer slope factor. SFo
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.

Table B.4.9

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	4.2E-04	1.6E-03	9.9E-04	1.4E-02	2.0E-02	5.9E-06	100%	0.082	2.4%	0.049	2.4%
Metals															
Aluminum	7429-90-5	124	J	0.12	--	6.2E-03	3.7E-03	--	1.0E+00	--	--	0.0062	0.18%	0.0037	0.18%
Antimony	7440-36-0	24.3	J	0.024	--	1.2E-03	7.3E-04	--	4.0E-04	--	--	3.0	90%	1.8	90%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	56.5	J	0.057	--	2.8E-03	1.7E-03	--	2.0E-01	--	--	0.014	0.42%	0.0085	0.42%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0022	--	1.1E-04	6.6E-05	--	5.0E-04	--	--	0.22	6.5%	0.13	6.5%
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	NC	--	4.0E-02	--	--	--	--	--	--
Manganese (non-diet)	7439-96-5	4.4	J	0.0044	--	2.2E-04	1.3E-04	--	2.4E-02	--	--	0.0091	0.27%	0.0055	0.27%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	6E-06	100%	3	100%	2	100%
Chromium (10)															
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	NC	--	1.5E+00	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	6E-06	--	3		2	
									Pathway Sums (including Chromium (VI)):	6E-06	--	3		2	

Table B.4.9

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.10
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event\text{- adjusted}} \le$ t*? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) (mg/kg-day)$^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) (mg/kg-day)$^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.000033	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	124	J	0.00012	0.0010	0.36	N/A	1.0	0.15	0.0020	8.3E-08	--	3.4E-05	2.1E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000034	0.025%	0.000021	0.025%
Antimony	7440-36-0	24.3	J	0.000024	0.0010	1.21	N/A	1.0	0.51	0.0042	1.6E-08	--	6.6E-06	4.1E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.11	81%	0.068	81%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	56.5	J	0.000057	0.0010	1.48	N/A	1.0	0.62	0.0045	3.8E-08	--	1.5E-05	9.5E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0011	0.80%	0.00068	0.80%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0000022	0.0010	1.08	N/A	1.0	0.45	0.0041	1.5E-09	--	6.0E-07	3.7E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.024	18%	0.015	18%
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	4.4	J	0.0000044	0.0010	0.51	N/A	1.0	0.21	0.0029	3.0E-09	--	1.2E-06	7.4E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0013	0.91%	0.00077	0.91%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0.0E+00		0.1	100%	0.1	100%
Chromium (19)																									
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00	--	0	--	0	--
																			Pathway Sums (including Chromium (VI)):	0E+00	--	0	--	0	--

Table B.4.10
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o /
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.11
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Fraction Ingested (FI)	1	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	3.9E-08	2.7E-06	1.4E-02	2.0E-02	5.4E-10	100%	0.00014	2.4%
Metals												
Aluminum	7429-90-5	124	J	0.12	--	1.0E-05	--	1.0E+00	--	--	0.000010	0.18%
Antimony	7440-36-0	24.3	J	0.024	--	2.0E-06	--	4.0E-04	--	--	0.0050	90%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	56.5	J	0.057	--	4.6E-06	--	2.0E-01	--	--	0.000023	0.42%
Beryllium	7440-41-7	0.4	U	NC	--	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0022	--	1.8E-07	--	5.0E-04	--	--	0.00036	6.5%
Cobalt	7440-48-4	4.4	U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	--	NC	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	4.4	J	0.0044	--	3.6E-07	--	2.4E-02	--	--	0.000015	0.27%
Mercury	7487-94-7	0.04	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	5E-10	100%	0.01	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	U	NC	--	NC	--	1.5E+00	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	5E-10	--	0.01	--
								Pathway Sums (including Chromium (VI)):	5E-10	--	0.01	--

Table B.4.11

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.12

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																						
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.000033	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																						
Aluminum	7429-90-5	124	J	0.00012	0.0010	0.36	N/A	1.0	0.15	0.0020	2.5E-07	--	8.84E-07	1	--	1.0E+00	--	1.0E+00	--	--	0.00000088	0.025%
Antimony	7440-36-0	24.3	J	0.000024	0.0010	1.2	N/A	1.0	0.51	0.0042	4.9E-08	--	1.73E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0029	81%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	56.5	J	0.000057	0.0010	1.5	N/A	1.0	0.62	0.0045	1.1E-07	--	4.03E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000029	0.80%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0000022	0.0010	1.08	N/A	1.0	0.45	0.0041	4.4E-09	--	1.57E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00063	18%
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	4.4	J	0.0000044	0.0010	0.51	N/A	1.0	0.21	0.0029	8.8E-09	--	3.14E-08	0.04	--	2.4E-02	--	9.6E-04	--	--	0.000033	0.91%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.4	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																			Cancer Risk		**Hazard Index**	
																		Pathway sums:	0E+00		0.004	100%
Chromium (19)																						
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--
																			Cancer Risk		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	0E+00	--	0.004	--
																		Pathway Sums (including Chromium (VI)):	0E+00	--	0.004	--

Table B.4.12
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional

values obtained from USEPA Regional Screening
Levels (RSLs) for Chemical Contaminants at
Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.13
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	2.3E-04	6.4E-04	1.4E-02	2.0E-02	3.2E-06	100.0%	0.032	2.4%
Metals												
Aluminum	7429-90-5	124	J	0.12	--	2.4E-03	--	1.0E+00	--	--	0.0024	0.18%
Antimony	7440-36-0	24.3	J	0.024	--	4.7E-04	--	4.0E-04	--	--	1.2	90%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	56.5	J	0.057	--	1.1E-03	--	2.0E-01	--	--	0.0054	0.42%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0022	--	4.2E-05	--	5.0E-04	--	--	0.085	6.5%
Cobalt	7440-48-4	4.4	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	4.4	J	0.0044	--	8.5E-05	--	2.4E-02	--	--	0.0035	0.27%
Mercury	7487-94-7	0.04	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	3E-06	100%	1	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	--	1.5E+00	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	3E-06	--	1	--
								Pathway Sums (including Chromium (VI)):	3E-06	--	1	--

Table B.4.13

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.14
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	33	0.000033	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	124 J	0.00012	0.0010	0.36	N/A	1.0	0.15	0.0020	1.2E-07	--	3.3E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.0000033	0.025%
Antimony	7440-36-0	24.3 J	0.000024	0.0010	1.21	N/A	1.0	0.51	0.0042	2.4E-08	--	6.5E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.011	81%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	56.5 J	0.000057	0.0010	1.48	N/A	1.0	0.62	0.0045	5.7E-08	--	1.5E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00011	0.80%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.2 J	0.0000022	0.0010	1.08	N/A	1.0	0.45	0.0041	2.2E-09	--	5.9E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0024	18%
Cobalt	7440-48-4	4.4 U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	--	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1 U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	--	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	4.4 J	0.0000044	0.0010	0.51	N/A	1.0	0.21	0.0029	4.4E-09	--	1.2E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.00012	0.91%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	--	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4 U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00		0.01	100%
Chromium (19)																					
Chromium (III)	16065-83-1	2.6 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--
Chromium (VI)	18540-29-9	2.6 U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.02	--
																	Pathway Sums (including Chromium (VI)):	0E+00	--	0.02	--

Table B.4.14
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional
values obtained from USEPA Regional
Screening Levels (RSLs) for Chemical
Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.15
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.033	2.9E-05	1.1E-04	6.8E-05	1.4E-02	2.0E-02	4.1E-07	100%	0.0056	2.4%	0.0034	2.4%
Metals															
Aluminum	7429-90-5	124	J	0.12	--	4.2E-04	2.5E-04	--	1.0E+00	--	--	0.00042	0.18%	0.00025	0.18%
Antimony	7440-36-0	24.3	J	0.024	--	8.3E-05	5.0E-05	--	4.0E-04	--	--	0.21	90%	0.12	90%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	56.5	J	0.057	--	1.9E-04	1.2E-04	--	2.0E-01	--	--	0.0010	0.42%	0.00058	0.42%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0022	--	7.5E-06	4.5E-06	--	5.0E-04	--	--	0.015	6.5%	0.0090	6.5%
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	NC	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	4.4	J	0.0044	--	1.5E-05	9.0E-06	--	2.4E-02	--	--	0.00063	0.27%	0.00038	0.27%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	4E-07	100%	0.2	100%	0.1	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	NC	--	1.5E+00	--	--	--	-- [11]	--	-- [11]
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	-- [12]	--	-- [13]	--	-- [13]
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	4E-07		0		0	
									Pathway Sums:	4E-07		0		0	

Table B.4.15

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.16

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	33		0.000033	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	124	J	0.00012	0.0010	0.36	N/A	1.0	0.15	0.0020	8.3E-08	--	3.5E-07	1.5E-07	1	--	1.0E+00	--	1.0E+00	--	--	0.00000035	0.025%	0.00000015	0.025%
Antimony	7440-36-0	24.3	J	0.000024	0.0010	1.21	N/A	1.0	0.51	0.0042	1.6E-08	--	6.9E-08	3.0E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0012	81%	0.00050	81%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	56.5	J	0.000057	0.0010	1.48	N/A	1.0	0.62	0.0045	3.8E-08	--	1.6E-07	6.9E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000012	0.80%	0.0000050	0.80%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.2	J	0.0000022	0.0010	1.08	N/A	1.0	0.45	0.0041	1.5E-09	--	6.3E-09	2.7E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00025	18%	0.00011	18%
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	4.4	J	0.0000044	0.0010	0.51	N/A	1.0	0.21	0.0029	3.0E-09	--	1.3E-08	5.4E-09	0.04	--	2.4E-02	--	9.6E-04	--	--	0.000013	0.91%	0.0000056	0.91%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0E+00		0.001	100%	0.0006	100%
Chromium (19)																									
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00		0.001		0.001	
																			Pathway Sums (including Chromium (VI)):	0E+00		0.001		0.001	

Table B.4.16
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 1
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
(13) SFo is the oral cancer slope factor. SFo
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.17
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals															
Aluminum	7429-90-5	828		0.83	--	4.1E-02	2.5E-02	--	1.0E+00	--	--	0.041	1.1%	0.025	1.1%
Antimony	7440-36-0	23.1	J	0.023	--	1.2E-03	6.9E-04	--	4.0E-04	--	--	2.9	74%	1.7	74%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	50.8	J	0.051	--	2.5E-03	1.5E-03	--	2.0E-01	--	--	0.013	0.33%	0.0076	0.33%
Beryllium	7440-41-7	0.4	U	NC	--	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	--	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	5.3	J	0.0053	--	2.6E-04	1.6E-04	--	3.0E-04	--	--	0.88	23%	0.53	23%
Copper	7440-50-8	7.2	J	0.0072	--	3.6E-04	2.2E-04	--	4.0E-02	--	--	0.0090	0.23%	0.0054	0.23%
Manganese (non-diet)	7439-96-5	23.7		0.024	--	1.2E-03	7.1E-04	--	2.4E-02	--	--	0.049	1.3%	0.030	1.3%
Mercury	7487-94-7	0.04	U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00		4	100%	2	100%
Chromium [10]															
Chromium (III)	16065-83-1	4.1	J	0.0041	--	2.0E-04	1.2E-04	--	1.5E+00	--	--	0.00014	0.0035% [11]	0.000082	0.0035% [11]
Chromium (VI)	18540-29-9	4.1	J	0.0041	5.3E-05	2.0E-04	1.2E-04	5.0E-01	3.0E-03	2.6E-05	100% [12]	0.068	1.7% [13]	0.041	1.7% [13]
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	0E+00	--	4		2	
									Pathway Sums (including Chromium (VI)):	3E-05	--	4		2	

Table B.4.17

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.18
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2\,FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event\text{- adjusted}} \le$ t*? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	828	0.00083	0.0010	0.36	N/A	1.0	0.15	0.0020	5.6E-07	--	2.3E-04	1.4E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00023	0.20%	0.00014	0.20%
Antimony	7440-36-0	23.1 J	0.000023	0.0010	1.21	N/A	1.0	0.51	0.0042	1.5E-08	--	6.3E-06	3.9E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.11	91%	0.065	91%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	50.8 J	0.000051	0.0010	1.48	N/A	1.0	0.62	0.0045	3.4E-08	--	1.4E-05	8.5E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0010	0.86%	0.00061	0.86%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.1 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	5.3 J	0.0000053	0.0004	0.54	N/A	1.0	0.22	0.0012	1.4E-09	--	5.8E-07	3.6E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.0019	1.7%	0.0012	1.7%
Copper	7440-50-8	7.2 J	0.0000072	0.0010	0.57	N/A	1.0	0.24	0.0031	4.8E-09	--	2.0E-06	1.2E-06	1	--	4.0E-02	--	4.0E-02	--	--	0.000049	0.043%	0.000030	0.043%
Manganese	7439-96-5	23.7	0.000024	0.0010	0.51	N/A	1.0	0.21	0.0029	1.6E-08	--	6.5E-06	4.0E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0068	5.9%	0.0041	5.9%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	--	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4 U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	0.0E+00		0.1	100%	0.1	100%
Chromium (19)																								
Chromium (III)	16065-83-1	4.1 J	0.0000041	0.0010	0.49	N/A	1.0	0.21	0.0028	2.8E-09	--	1.1E-06	6.9E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000058	0.050% (20)	0.000035	0.050% (20)
Chromium (VI)	18540-29-9	4.1 J	0.0000041	0.0020	0.49	N/A	1.0	0.21	0.0055	5.5E-09	5.9E-07	2.2E-06	1.4E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	1.2E-05	100% (21)	0.030	21% (22)	0.018	21% (22)
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	0E+00	--	0.1	--	0.07	--
																		Pathway Sums (including Chromium (VI)):	1E-05	--	0.1	--	0.09	--

Table B.4.18
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o /
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.19
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	828		0.83	--	6.8E-05	--	1.0E+00	--	--	0.000068	1.1%
Antimony	7440-36-0	23.1	J	0.023	--	1.9E-06	--	4.0E-04	--	--	0.0047	74%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	50.8	J	0.051	--	4.2E-06	--	2.0E-01	--	--	0.000021	0.33%
Beryllium	7440-41-7	0.4	U	NC	--	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	--	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	5.3	J	0.0053	--	4.4E-07	--	3.0E-04	--	--	0.0015	23%
Copper	7440-50-8	7.2	J	0.0072	--	5.9E-07	--	4.0E-02	--	--	0.000015	0.23%
Manganese	7439-96-5	23.7		0.024	--	1.9E-06	--	2.4E-02	--	--	0.000081	1.3%
Mercury	7487-94-7	0.04	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	0E+00		0.01	100%
Chromium [10]												
Chromium (III)	16065-83-1	4.1	J	0.0041	--	3.4E-07	--	1.5E+00	--	--	0.00000022	0.0035% [11]
Chromium (VI)	18540-29-9	4.1	J	0.0041	4.8E-09	3.4E-07	5.0E-01	3.0E-03	2.4E-09	100% [12]	0.00011	1.7% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	0E+00	--	0.01	--
								Pathway Sums (including Chromium (VI)):	2E-09	--	0.01	--

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.20

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] (mg/kg-day)$^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] (mg/kg-day)$^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	828	0.00083	0.0010	0.36	N/A	1.0	0.15	0.0020	1.7E-06	--	5.90E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.0000059	0.20%
Antimony	7440-36-0	23.1 J	0.000023	0.0010	1.2	N/A	1.0	0.51	0.0042	4.6E-08	--	1.65E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0027	91%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	50.8 J	0.000051	0.0010	1.5	N/A	1.0	0.62	0.0045	1.0E-07	--	3.62E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000026	0.86%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.1 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	5.3 J	0.0000053	0.0004	0.54	N/A	1.0	0.22	0.0012	4.2E-09	--	1.51E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.000050	1.7%
Copper	7440-50-8	7.2 J	0.0000072	0.0010	0.57	N/A	1.0	0.24	0.0031	1.4E-08	--	5.13E-08	1	--	4.0E-02	--	4.0E-02	--	--	0.0000013	0.043%
Manganese	7439-96-5	23.7	0.000024	0.0010	0.51	N/A	1.0	0.21	0.0029	4.7E-08	--	1.69E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.00018	5.9%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.4	N/A	1.0	3.49	0.0063	NC	--	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4 U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2 U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	--	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00		0.003	100%
Chromium [19]																					
Chromium (III)	16065-83-1	4.1 J	0.0000041	0.0010	0.49	N/A	1.0	0.21	0.0028	8.2E-09	--	2.92E-08	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000015	0.050% [20]
Chromium (VI)	18540-29-9	4.1 J	0.0000041	0.0020	0.4934691	N/A	1.0	0.21	0.0055	1.6E-08	8.4E-10	0.0000001	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	1.7E-08	100% [21]	0.00078	21% [22]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.003	--
																	Pathway Sums (including Chromium (VI)):	2E-08	--	0.004	--

Table B.4.20

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional

values obtained from USEPA Regional Screening
Levels (RSLs) for Chemical Contaminants at
Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.21

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	828		0.83	--	1.6E-02	--	1.0E+00	--	--	0.016	1.1%
Antimony	7440-36-0	23.1	J	0.023	--	4.4E-04	--	4.0E-04	--	--	1.1	74%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	50.8	J	0.051	--	9.8E-04	--	2.0E-01	--	--	0.0049	0.33%
Beryllium	7440-41-7	0.4	U	NC	--	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	--	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	5.3	J	0.0053	--	1.0E-04	--	3.0E-04	--	--	0.34	23%
Copper	7440-50-8	7.2	J	0.0072	--	1.4E-04	--	4.0E-02	--	--	0.0035	0.23%
Manganese	7439-96-5	23.7		0.024	--	4.6E-04	--	2.4E-02	--	--	0.019	1.3%
Mercury	7487-94-7	0.04	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	0E+00		1	100%
Chromium [10]												
Chromium (III)	16065-83-1	4.1	J	0.0041	--	7.9E-05	--	1.5E+00	--	--	0.000053	0.0035% [11]
Chromium (VI)	18540-29-9	4.1	J	0.0041	2.8E-05	7.9E-05	5.0E-01	3.0E-03	1.4E-05	100% [12]	0.026	1.7% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	0E+00	--	1	--
								Pathway Sums (including Chromium (VI)):	1E-05	--	2	--

[1] COPC = Constituent of potential concern.
[2] CAS = Chemical Abstracts Service number.
[3] Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
[4] μg/L = microgram per liter.
[5] mg/L = milligram per liter.
[6] mg/kg-day = milligram per kilogram-day.
[7] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[8] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
[9] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[10] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
[11] Percent increase in cumulative hazard due to chromium (III).
[12] Percent increase in cumulative risk due to chromium (VI).
[13] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.22
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm²-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm²
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm³
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	828	0.00083	0.0010	0.36	N/A	1.0	0.15	0.0020	8.3E-07	--	2.2E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000022	0.20%
Antimony	7440-36-0	23.1 J	0.000023	0.0010	1.21	N/A	1.0	0.51	0.0042	2.3E-08	--	6.2E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.010	91%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	50.8 J	0.000051	0.0010	1.48	N/A	1.0	0.62	0.0045	5.1E-08	--	1.4E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000097	0.86%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.1 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	5.3 J	0.0000053	0.0004	0.54	N/A	1.0	0.22	0.0012	2.1E-09	--	5.7E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.00019	1.7%
Copper	7440-50-8	7.2 J	0.0000072	0.0010	0.57	N/A	1.0	0.24	0.0031	7.2E-09	--	1.9E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.0000048	0.043%
Manganese	7439-96-5	23.7	0.000024	0.0010	0.51	N/A	1.0	0.21	0.0029	2.4E-08	--	6.3E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.00066	5.9%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	--	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4 U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00		0.011	100%
Chromium [19]																					
Chromium (III)	16065-83-1	4.1 J	0.0000041	0.0010	0.49	N/A	1.0	0.21	0.0028	4.1E-09	--	1.1E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000056	0.037% [20]
Chromium (VI)	18540-29-9	4.1 J	0.0000041	0.0020	0.49	N/A	1.0	0.21	0.0055	8.2E-09	7.8E-08	2.2E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	1.6E-06	100% [21]	0.00292	19% [22]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.02	--
																	Pathway Sums (including Chromium (VI)):	2E-06	--	0.02	--

Table B.4.22

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional

values obtained from USEPA Regional Screening
Levels (RSLs) for Chemical Contaminants at
Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.23

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day / year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals															
Aluminum	7429-90-5	828		0.83	--	2.8E-03	1.7E-03	--	1.0E+00	--	--	0.0028	1.1%	0.0017	1.1%
Antimony	7440-36-0	23.1	J	0.023	--	7.9E-05	4.7E-05	--	4.0E-04	--	--	0.20	74%	0.12	74%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	50.8	J	0.051	--	1.7E-04	1.0E-04	--	2.0E-01	--	--	0.00087	0.33%	0.00052	0.33%
Beryllium	7440-41-7	0.4	U	NC	--	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	--	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	5.3	J	0.0053	--	1.8E-05	1.1E-05	--	3.0E-04	--	--	0.060	23%	0.036	23%
Copper	7440-50-8	7.2	J	0.0072	--	2.5E-05	1.5E-05	--	4.0E-02	--	--	0.00062	0.23%	0.00037	0.23%
Manganese	7439-96-5	23.7		0.024	--	8.1E-05	4.9E-05	--	2.4E-02	--	--	0.0034	1.3%	0.0020	1.3%
Mercury	7487-94-7	0.04	U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00		0.3	100%	0.2	100%
Chromium [10]															
Chromium (III)	16065-83-1	4.1	J	0.0041	--	1.4E-05	8.4E-06	--	1.5E+00	--	--	0.0000093	0.0035% [11]	0.000006	0.0035% [11]
Chromium (VI)	18540-29-9	4.1	J	0.0041	3.6E-06	1.4E-05	8.4E-06	5.0E-01	3.0E-03	1.8E-06	100% [12]	0.0047	1.7% [13]	0.0028	1.7% [13]
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00		0.3		0.2	
									Pathway Sums:	2E-06		0.3		0.2	

Table B.4.23

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.24

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	--	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	828		0.00083	0.0010	0.36	N/A	1.0	0.15	0.0020	5.6E-07	--	2.4E-06	1.0E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.0000024	0.20%	0.0000010	0.20%
Antimony	7440-36-0	23.1	J	0.000023	0.0010	1.21	N/A	1.0	0.51	0.0042	1.5E-08	--	6.6E-08	2.8E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0011	91%	0.00047	91%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	50.8	J	0.000051	0.0010	1.48	N/A	1.0	0.62	0.0045	3.4E-08	--	1.4E-07	6.2E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000010	0.86%	0.0000045	0.86%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	5.3	J	0.0000053	0.0004	0.54	N/A	1.0	0.22	0.0012	1.4E-09	--	6.0E-09	2.6E-09	1	--	3.0E-04	--	3.0E-04	--	--	0.000020	1.7%	0.0000087	1.7%
Copper	7440-50-8	7.2	J	0.0000072	0.0010	0.57	N/A	1.0	0.24	0.0031	4.8E-09	--	2.1E-08	8.9E-09	1	--	4.0E-02	--	4.0E-02	--	--	0.00000051	0.043%	0.00000022	0.043%
Manganese	7439-96-5	23.7		0.000024	0.0010	0.51	N/A	1.0	0.21	0.0029	1.6E-08	--	6.8E-08	2.9E-08	0.04	--	2.4E-02	--	9.6E-04	--	--	0.000070	5.9%	0.000030	5.9%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	--	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0E+00	0%	0.001	100%	0.0005	100%
Chromium [19]																									
Chromium (III)	16065-83-1	4.1	J	0.0000041	0.0010	0.49	N/A	1.0	0.21	0.0028	2.8E-09	--	1.2E-08	5.0E-09	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000006	0.050% [20]	0.00000026	0.050% [20]
Chromium (VI)	18540-29-9	4.1	J	0.0000041	0.0020	0.49	N/A	1.0	0.21	0.0055	5.5E-09	4.9E-09	2.3E-08	1.0E-08	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	9.8E-08	100% [21]	0.00031	21% [22]	0.00013	21% [22]
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00		0.001		0.001	
																			Pathway Sums (including Chromium (VI)):	1E-07		0.002		0.001	

Table B.4.24
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
(13) SFo is the oral cancer slope factor. SFo
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.25
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.012	1.5E-04	6.0E-04	3.6E-04	1.4E-02	2.0E-02	2.2E-06	100%	0.030	0.46%	0.018	0.46%
Metals															
Aluminum	7429-90-5	83.5	J	0.084	--	4.2E-03	2.5E-03	--	1.0E+00	--	--	0.0042	0.064%	0.0025	0.064%
Antimony	7440-36-0	52.1	J	0.052	--	2.6E-03	1.6E-03	--	4.0E-04	--	--	6.5	99%	3.9	99%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	25.5	J	0.026	--	1.3E-03	7.6E-04	--	2.0E-01	--	--	0.0064	0.10%	0.0038	0.10%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	NC	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.9	J	0.0039	--	1.9E-04	1.2E-04	--	4.0E-02	--	--	0.0049	0.074%	0.0029	0.074%
Manganese (non-diet)	7439-96-5	2.9	J	0.0029	--	1.4E-04	8.7E-05	--	2.4E-02	--	--	0.0060	0.092%	0.0036	0.092%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	2E-06	100%	7	100%	4	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	NC	--	1.5E+00	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	2E-06	--	7		4	
									Pathway Sums (including Chromium (VI)):	2E-06	--	7		4	

Table B.4.25

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.26
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days/year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days/year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days/year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event\text{- adjusted}} \le$ t*? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] (mg/kg-day)$^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] (mg/kg-day)$^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.000012	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	83.5	J	0.0000835	0.0010	0.36	N/A	1.0	0.15	0.0020	5.6E-08	--	2.3E-05	1.4E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000023	0.010%	0.000014	0.010%
Antimony	7440-36-0	52.1	J	0.0000521	0.0010	1.21	N/A	1.0	0.51	0.0042	3.5E-08	--	1.4E-05	8.8E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.24	99%	0.15	99%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	25.5	J	0.0000255	0.0010	1.48	N/A	1.0	0.62	0.0045	1.7E-08	--	7.0E-06	4.3E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00050	0.21%	0.00031	0.21%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.9	J	0.0000039	0.0010	0.57	N/A	1.0	0.24	0.0031	2.6E-09	--	1.1E-06	6.6E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.000027	0.011%	0.000016	0.011%
Manganese	7439-96-5	2.9	J	0.0000029	0.0010	0.51	N/A	1.0	0.21	0.0029	1.9E-09	--	7.9E-07	4.9E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.00083	0.35%	0.00051	0.35%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0.0E+00	--	0.2	100%	0.1	100%
Chromium [19]																									
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00	--	0.2	--	0.1	--
																			Pathway Sums (including Chromium (VI)):	0E+00	--	0.2	--	0.1	--

Table B.4.26
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.27

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.012	1.4E-08	9.9E-07	1.4E-02	2.0E-02	2.0E-10	100%	0.000049	0.46%
Metals												
Aluminum	7429-90-5	83.5	J	0.084	--	6.9E-06	--	1.0E+00	--	--	0.0000069	0.064%
Antimony	7440-36-0	52.1	J	0.052	--	4.3E-06	--	4.0E-04	--	--	0.011	99%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	25.5	J	0.026	--	2.1E-06	--	2.0E-01	--	--	0.000010	0.10%
Beryllium	7440-41-7	0.4	U	NC	--	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	--	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.9	J	0.0039	--	3.2E-07	--	4.0E-02	--	--	0.0000080	0.074%
Manganese	7439-96-5	2.9	J	0.0029	--	2.4E-07	--	2.4E-02	--	--	0.000010	0.092%
Mercury	7487-94-7	0.04	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	2E-10	--	0.01	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	U	NC	--	NC	--	1.5E+00	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-10	--	0.01	--
								Pathway Sums (including Chromium (VI)):	2E-10	--	0.01	--

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.28

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																						
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.000012	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																						
Aluminum	7429-90-5	83.5	J	0.000084	0.0010	0.36	N/A	1.0	0.15	0.0020	1.7E-07	--	5.95E-07	1	--	1.0E+00	--	1.0E+00	--	--	0.00000060	0.010%
Antimony	7440-36-0	52.1	J	0.000052	0.0010	1.2	N/A	1.0	0.51	0.0042	1.0E-07	--	3.71E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0062	99%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	25.5	J	0.000026	0.0010	1.5	N/A	1.0	0.62	0.0045	5.1E-08	--	1.82E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000013	0.21%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.9	J	0.0000039	0.0010	0.57	N/A	1.0	0.24	0.0031	7.8E-09	--	2.78E-08	1	--	4.0E-02	--	4.0E-02	--	--	0.00000070	0.011%
Manganese	7439-96-5	2.9	J	0.0000029	0.0010	0.51	N/A	1.0	0.21	0.0029	5.8E-09	--	2.07E-08	0.04	--	2.4E-02	--	9.6E-04	--	--	0.000022	0.35%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.4	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																			Cancer Risk		**Hazard Index**	
																		Pathway sums:	0E+00	--	0.01	100%
Chromium (19)																						
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--
																			Cancer Risk		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	0E+00	--	0.01	--
																		Pathway Sums (including Chromium (VI)):	0E+00	--	0.01	--

Table B.4.28

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value.

Values obtained from USEPA Regional

values obtained from USEPA Regional
Screening Levels (RSLs) for Chemical
Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values

(16) SF_d is the dermal cancer slope factor,

(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.29

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.012	8.3E-05	2.3E-04	1.4E-02	2.0E-02	1.2E-06	100.0%	0.012	0.46%
Metals												
Aluminum	7429-90-5	83.5	J	0.084	--	1.6E-03	--	1.0E+00	--	--	0.0016	0.064%
Antimony	7440-36-0	52.1	J	0.052	--	1.0E-03	--	4.0E-04	--	--	2.5	99%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	25.5	J	0.026	--	4.9E-04	--	2.0E-01	--	--	0.0025	0.10%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	NC	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.9	J	0.0039	--	7.5E-05	--	4.0E-02	--	--	0.0019	0.074%
Manganese	7439-96-5	2.9	J	0.0029	--	5.6E-05	--	2.4E-02	--	--	0.0023	0.092%
Mercury	7487-94-7	0.04	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	1E-06	--	3	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	U	NC	--	NC	--	1.5E+00	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	1E-06	--	3	--
								Pathway Sums (including Chromium (VI)):	1E-06	--	3	--

[1] COPC = Constituent of potential concern.
[2] CAS = Chemical Abstracts Service number.
[3] Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
[4] μg/L = microgram per liter.
[5] mg/L = milligram per liter.
[6] mg/kg-day = milligram per kilogram-day.
[7] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[8] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
[9] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[10] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.30
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) (mg/kg-day)$^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) (mg/kg-day)$^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	12	0.000012	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	83.5 J	0.000084	0.0010	0.36	N/A	1.0	0.15	0.0020	8.4E-08	--	2.2E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.0000022	0.010%
Antimony	7440-36-0	52.1 J	0.000052	0.0010	1.21	N/A	1.0	0.51	0.0042	5.2E-08	--	1.4E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.023	99%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	25.5 J	0.000026	0.0010	1.48	N/A	1.0	0.62	0.0045	2.6E-08	--	6.8E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000049	0.21%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.1 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	4.4 U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.9 J	0.0000039	0.0010	0.57	N/A	1.0	0.24	0.0031	3.9E-09	--	1.0E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.0000026	0.011%
Manganese	7439-96-5	2.9 J	0.0000029	0.0010	0.51	N/A	1.0	0.21	0.0029	2.9E-09	--	7.8E-08	0.04	--	2.4E-02	--	9.6E-04	--	--	0.000081	0.35%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4 U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00	--	0.02	100%
Chromium (19)																					
Chromium (III)	16065-83-1	2.6 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--
Chromium (VI)	18540-29-9	2.6 U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.02	--
																	Pathway Sums (including Chromium (VI)):	0E+00	--	0.02	--

Table B.4.30
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
Values obtained from USEPA Regional
values obtained from USEPA Regional
Screening Levels (RSLs) for Chemical
Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor,
(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.31

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.012	1.1E-05	4.1E-05	2.5E-05	1.4E-02	2.0E-02	1.5E-07	100%	0.0021	0.46%	0.0012	0.46%
Metals															
Aluminum	7429-90-5	83.5	J	0.084	--	2.9E-04	1.7E-04	--	1.0E+00	--	--	0.00029	0.064%	0.00017	0.064%
Antimony	7440-36-0	52.1	J	0.052	--	1.8E-04	1.1E-04	--	4.0E-04	--	--	0.45	99%	0.27	99%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	25.5	J	0.026	--	8.7E-05	5.2E-05	--	2.0E-01	--	--	0.00044	0.10%	0.00026	0.10%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	NC	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.9	J	0.0039	--	1.3E-05	8.0E-06	--	4.0E-02	--	--	0.00033	0.074%	0.00020	0.074%
Manganese	7439-96-5	2.9	J	0.0029	--	9.9E-06	6.0E-06	--	2.4E-02	--	--	0.00041	0.092%	0.00025	0.092%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	1E-07	100%	0.4	100%	0.3	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	NC	--	1.5E+00	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	1E-07		0.4		0.3	
									Pathway Sums:	1E-07		0.4		0.3	

Table B.4.31

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.32

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days/year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days/year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days/year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD / RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	$t_{event} \le$ t*? (Yes/N	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	12		0.000012	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	83.5	J	0.000084	0.0010	0.36	N/A	1.0	0.15	0.0020	5.6E-08	--	2.4E-07	1.0E-07	1	--	1.0E+00	--	1.0E+00	--	--	0.00000024	0.010%	0.00000010	0.010%
Antimony	7440-36-0	52.1	J	0.000052	0.0010	1.21	N/A	1.0	0.51	0.0042	3.5E-08	--	1.5E-07	6.4E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0025	99%	0.0011	99%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	25.5	J	0.000026	0.0010	1.48	N/A	1.0	0.62	0.0045	1.7E-08	--	7.3E-08	3.1E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0000052	0.21%	0.0000022	0.21%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	--	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.9	J	0.0000039	0.0010	0.57	N/A	1.0	0.24	0.0031	2.6E-09	--	1.1E-08	4.8E-09	1	--	4.0E-02	--	4.0E-02	--	--	0.00000028	0.011%	0.00000012	0.011%
Manganese	7439-96-5	2.9	J	0.0000029	0.0010	0.51	N/A	1.0	0.21	0.0029	1.9E-09	--	8.3E-09	3.6E-09	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0000086	0.35%	0.0000037	0.35%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	--	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0E+00		0.002	100%	0.001	100%
Chromium (19)																									
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00		0.002		0.001	
																			Pathway Sums (including Chromium (VI)):	0E+00		0.002		0.001	

Table B.4.32

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
(13) SFo is the oral cancer slope factor. SFo
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values
(16) SF_d is the dermal cancer slope factor, derived
(17) RfD_d is the dermal reference dose, derived
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.33

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	11		0.011	1.4E-04	5.5E-04	3.3E-04	1.4E-02	2.0E-02	2.0E-06	5.7%	0.027	0.24%	0.016	0.24%
Metals															
Aluminum	7429-90-5	17700		18	--	8.8E-01	5.3E-01	--	1.0E+00	--	--	0.88	7.8%	0.53	7.8%
Antimony	7440-36-0	49.6	J	0.050	--	2.5E-03	1.5E-03	--	4.0E-04	--	--	6.2	55%	3.7	55%
Arsenic	7440-38-2	1.7	J	0.0017	2.2E-05	8.5E-05	5.1E-05	1.5E+00	3.0E-04	3.3E-05	94%	0.28	2.5%	0.17	2.5%
Barium	7440-39-3	195	J	0.20	--	9.7E-03	5.8E-03	--	2.0E-01	--	--	0.049	0.43%	0.029	0.43%
Beryllium	7440-41-7	0.87	J	0.00087	--	4.3E-05	2.6E-05	--	2.0E-03	--	--	0.022	0.19%	0.013	0.19%
Cadmium	7440-43-9	3.8	J	0.0038	--	1.9E-04	1.1E-04	--	5.0E-04	--	--	0.38	3.37%	0.23	3.4%
Cobalt	7440-48-4	11	J	0.011	--	5.5E-04	3.3E-04	--	3.0E-04	--	--	1.8	16%	1.1	16%
Copper	7440-50-8	79.2		0.079	--	3.9E-03	2.4E-03	--	4.0E-02	--	--	0.10	0.88%	0.059	0.88%
Manganese (non-diet)	7439-96-5	384		0.38	--	1.9E-02	1.2E-02	--	2.4E-02	--	--	0.80	7.1%	0.48	7.1%
Mercury	7487-94-7	1.8		0.0018	--	9.0E-05	5.4E-05	--	3.0E-04	--	--	0.30	2.7%	0.18	2.7%
Nickel	7440-02-0	43.9		0.044	--	2.2E-03	1.3E-03	--	2.0E-02	--	--	0.11	0.97%	0.066	0.97%
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	29.7	J	0.030	--	1.5E-03	8.9E-04	--	5.0E-03	--	--	0.30	2.6%	0.18	2.6%
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	3E-05	100%	11	100%	7	100%
Chromium (10)															
Chromium (III)	16065-83-1	28.9		0.0289	--	1.4E-03	8.7E-04	--	1.5E+00	--	--	0.0010	0.0085% (11)	0.00058	0.0085% (11)
Chromium (VI)	18540-29-9	28.9		0.0289	3.7E-04	1.4E-03	8.7E-04	5.0E-01	3.0E-03	1.9E-04	84% (12)	0.48	4.1% (13)	0.29	4.1% (13)
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	3E-05	--	11	--	7	--
									Pathway Sums (including Chromium (VI)):	2E-04	--	12	--	7	--

Table B.4.33

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.34

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event\text{-}adjusted} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	11	0.000011	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	17700	0.018	0.0010	0.36	N/A	1.0	0.15	0.0020	1.2E-05	--	4.8E-03	3.0E-03	1	--	1.0E+00	--	1.0E+00	--	--	0.0048	0.97%	0.0030	0.97%
Antimony	7440-36-0	49.6 J	0.000050	0.0010	1.21	N/A	1.0	0.51	0.0042	3.3E-08	--	1.4E-05	8.3E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.23	45.42%	0.14	45%
Arsenic	7440-38-2	1.7 J	0.0000017	0.0010	0.66	N/A	1.0	0.28	0.0033	1.1E-09	1.2E-07	4.6E-07	2.9E-07	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.8E-07	100%	0.0015	0.31%	0.0010	0.31%
Barium	7440-39-3	195 J	0.00020	0.0010	1.48	N/A	1.0	0.62	0.0045	1.3E-07	--	5.3E-05	3.3E-05	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0038	0.77%	0.0023	0.77%
Beryllium	7440-41-7	0.87 J	0.00000087	0.0010	0.28	N/A	1.0	0.12	0.0012	5.8E-10	--	2.4E-07	1.5E-07	0.007	--	2.0E-03	--	1.4E-05	--	--	0.017	3.4%	0.010	3.4%
Cadmium	7440-43-9	3.8 J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	2.5E-09	--	1.0E-06	6.4E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.042	8.4%	0.026	8.4%
Cobalt	7440-48-4	11 J	0.000011	0.0004	0.54	N/A	1.0	0.22	0.0012	3.0E-09	--	1.2E-06	7.4E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.0040	0.81%	0.0025	0.81%
Copper	7440-50-8	79.2	0.000079	0.0010	0.57	N/A	1.0	0.24	0.0031	5.3E-08	--	2.2E-05	1.3E-05	1	--	4.0E-02	--	4.0E-02	--	--	0.00054	0.11%	0.00033	0.11%
Manganese	7439-96-5	384	0.00038	0.0010	0.51	N/A	1.0	0.21	0.0029	2.6E-07	--	1.1E-04	6.5E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.11	22%	0.067	22%
Mercury	7487-94-7	1.8	0.0000018	0.0010	8.36	N/A	1.0	3.49	0.0063	1.2E-09	--	4.9E-07	3.0E-07	0.07	--	3.0E-04	--	2.1E-05	--	--	0.023	4.7%	0.014	4.7%
Nickel	7440-02-0	43.9	0.000044	0.0002	0.54	N/A	1.0	0.22	0.0006	5.9E-09	--	2.4E-06	1.5E-06	0.04	--	2.0E-02	--	8.0E-04	--	--	0.0030	0.60%	0.0018	0.60%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	29.7 J	0.000030	0.0010	0.49	N/A	1.0	0.20	0.0027	2.0E-08	--	8.1E-06	5.0E-06	0.026	--	5.0E-03	--	1.3E-04	--	--	0.062	13%	0.038	13%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.8E-07	100%	0.5	100%	0.3	100%
Chromium [19]																								
Chromium (III)	16065-83-1	28.9	0.000029	0.0010	0.49	N/A	1.0	0.21	0.0028	1.9E-08	--	7.9E-06	4.9E-06	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00041	0.081% [20]	0.00025	0.081% [20]
Chromium (VI)	18540-29-9	28.9	0.000029	0.0020	0.49	N/A	1.0	0.21	0.0055	3.9E-08	4.1E-06	1.6E-05	9.7E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	8.3E-05	100% [21]	0.21	30% [22]	0.13	30% [22]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	2E-07	--	0.5	--	0.3	--
																		Pathway Sums (including Chromium (VI)):	8E-05	--	0.7	--	0.4	--

Table B.4.34
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.35

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11		0.011	1.3E-08	9.0E-07	1.4E-02	2.0E-02	1.8E-10	5.7%	0.000045	0.24%
Metals												
Aluminum	7429-90-5	17700		18	--	1.5E-03	--	1.0E+00	--	--	0.0015	7.8%
Antimony	7440-36-0	49.6	J	0.050	--	4.1E-06	--	4.0E-04	--	--	0.010	55%
Arsenic	7440-38-2	1.7	J	0.0017	2.0E-09	1.4E-07	1.5E+00	3.0E-04	3.0E-09	94%	0.00047	2.5%
Barium	7440-39-3	195	J	0.20	--	1.6E-05	--	2.0E-01	--	--	0.000080	0.43%
Beryllium	7440-41-7	0.87	J	0.00087	--	7.2E-08	--	2.0E-03	--	--	0.000036	0.19%
Cadmium	7440-43-9	3.8	J	0.0038	--	3.1E-07	--	5.0E-04	--	--	0.00062	3.4%
Cobalt	7440-48-4	11	J	0.011	--	9.0E-07	--	3.0E-04	--	--	0.0030	16%
Copper	7440-50-8	79.2		0.079	--	6.5E-06	--	4.0E-02	--	--	0.00016	0.88%
Manganese	7439-96-5	384		0.38	--	3.2E-05	--	2.4E-02	--	--	0.0013	7.1%
Mercury	7487-94-7	1.8		0.0018	--	1.5E-07	--	3.0E-04	--	--	0.00049	2.7%
Nickel	7440-02-0	43.9		0.044	--	3.6E-06	--	2.0E-02	--	--	0.00018	0.97%
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	29.7	J	0.030	--	2.4E-06	--	5.0E-03	--	--	0.00049	2.6%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	3E-09	100%	0.02	100%
Chromium [10]												
Chromium (III)	16065-83-1	28.9		0.029	--	2.4E-06	--	1.5E+00	--	--	0.0000016	0.0085% [11]
Chromium (VI)	18540-29-9	28.9		0.029	3.4E-08	2.4E-06	5.0E-01	3.0E-03	1.7E-08	84% [12]	0.00079	4.1% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	3E-09	--	0.02	--
								Pathway Sums (including Chromium (VI)):	2E-08	--	0.02	--

[1] COPC = Constituent of potential concern.

[2] CAS = Chemical Abstracts Service number.

[3] Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

[4] µg/L = microgram per liter.

[5] mg/L = milligram per liter.

[6] mg/kg-day = milligram per kilogram-day.

[7] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

[8] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

[9] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

[10] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

[11] Percent increase in cumulative hazard due to chromium (III).

[12] Percent increase in cumulative risk due to chromium (VI).

[13] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.36
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11	0.000011	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	17700	0.018	0.0010	0.36	N/A	1.0	0.15	0.0020	3.5E-05	--	1.26E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00013	0.97%
Antimony	7440-36-0	49.6 J	0.000050	0.0010	1.2	N/A	1.0	0.51	0.0042	9.9E-08	--	3.54E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0059	45%
Arsenic	7440-38-2	1.7 J	0.0000017	0.0010	0.66	N/A	1.0	0.28	0.0033	3.4E-09	1.7E-10	1.21E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.6E-10	100%	0.000040	0.31%
Barium	7440-39-3	195 J	0.00020	0.0010	1.5	N/A	1.0	0.62	0.0045	3.9E-07	--	1.39E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00010	0.77%
Beryllium	7440-41-7	0.87 J	0.00000087	0.0010	0.28	N/A	1.0	0.12	0.0012	1.7E-09	--	6.20E-09	0.007	--	2.0E-03	--	1.4E-05	--	--	0.00044	3.4%
Cadmium	7440-43-9	3.8 J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	7.6E-09	--	2.71E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0011	8.4%
Cobalt	7440-48-4	11 J	0.000011	0.0004	0.54	N/A	1.0	0.22	0.0012	8.8E-09	--	3.14E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.00010	0.81%
Copper	7440-50-8	79.2	0.000079	0.0010	0.57	N/A	1.0	0.24	0.0031	1.6E-07	--	5.65E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.000014	0.11%
Manganese	7439-96-5	384	0.00038	0.0010	0.51	N/A	1.0	0.21	0.0029	7.7E-07	--	2.74E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0029	22%
Mercury	7487-94-7	1.8	0.0000018	0.0010	8.4	N/A	1.0	3.49	0.0063	3.6E-09	--	1.28E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00061	4.7%
Nickel	7440-02-0	43.9	0.000044	0.0002	0.54	N/A	1.0	0.22	0.0006	1.8E-08	--	6.26E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000078	0.60%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	29.7 J	0.000030	0.0010	0.49	N/A	1.0	0.20	0.0027	5.9E-08	--	2.12E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0016	13%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	3E-10	100%	0.01	100%
Chromium (19)																					
Chromium (III)	16065-83-1	28.9	0.000029	0.0010	0.49	N/A	1.0	0.21	0.0028	5.8E-08	--	2.06E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000011	0.081% (20)
Chromium (VI)	18540-29-9	28.9	0.000029	0.0020	0.4934691	N/A	1.0	0.21	0.0055	1.2E-07	5.9E-09	0.0000004	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	1.2E-07	100% (21)	0.0055	30% (22)
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	3E-10	--	0.01	--
																	Pathway Sums (including Chromium (VI)):	1E-07	--	0.02	--

Table B.4.36
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.37
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total		Hazard Quotient	% of Total	
Semivolatile Organic Compounds														
Bis(2-Ethylhexyl)phthalate	117-81-7	11		0.011	7.6E-05	2.1E-04	1.4E-02	2.0E-02	1.1E-06	5.7%		0.011	0.24%	
Metals														
Aluminum	7429-90-5	17700		18	--	3.4E-01	--	1.0E+00	--	--		0.34	7.8%	
Antimony	7440-36-0	49.6	J	0.050	--	9.6E-04	--	4.0E-04	--	--		2.4	55%	
Arsenic	7440-38-2	1.7	J	0.0017	1.2E-05	3.3E-05	1.5E+00	3.0E-04	1.8E-05	94%		0.11	2.5%	
Barium	7440-39-3	195	J	0.20	--	3.8E-03	--	2.0E-01	--	--		0.019	0.43%	
Beryllium	7440-41-7	0.87	J	0.00087	--	1.7E-05	--	2.0E-03	--	--		0.0084	0.19%	
Cadmium	7440-43-9	3.8	J	0.0038	--	7.3E-05	--	5.0E-04	--	--		0.15	3.4%	
Cobalt	7440-48-4	11	J	0.011	--	2.1E-04	--	3.0E-04	--	--		0.71	16%	
Copper	7440-50-8	79.2		0.079	--	1.5E-03	--	4.0E-02	--	--		0.038	0.88%	
Manganese	7439-96-5	384		0.38	--	7.4E-03	--	2.4E-02	--	--		0.31	7.1%	
Mercury	7487-94-7	1.8		0.0018	--	3.5E-05	--	3.0E-04	--	--		0.12	2.66%	
Nickel	7440-02-0	43.9		0.044	--	8.5E-04	--	2.0E-02	--	--		0.042	0.97%	
Thallium	7440-28-0	1.2	U	NC	NC	NC	--	1.0E-05	--	--		--	--	
Vanadium	7440-62-2	29.7	J	0.030	--	5.7E-04	--	5.0E-03	--	--		0.11	2.6%	
									Cancer Risk			**Hazard Index**		
								Pathway Sums:	2E-05	100%		4	100%	
Chromium (10)														
Chromium (III)	16065-83-1	28.9		0.029	--	5.6E-04	--	1.5E+00	--	--		0.00037	0.0085%	(11)
Chromium (VI)	18540-29-9	28.9		0.029	2.0E-04	5.6E-04	5.0E-01	3.0E-03	9.9E-05	84%	(12)	0.19	4.1%	(13)
									Cancer Risk			**Hazard Index**		
								Pathway Sums (including Chromium(III)):	2E-05	--		4	--	
								Pathway Sums (including Chromium (VI)):	1E-04	--		5	--	

[1] COPC = Constituent of potential concern.
[2] CAS = Chemical Abstracts Service number.
[3] Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
[4] μg/L = microgram per liter.
[5] mg/L = milligram per liter.
[6] mg/kg-day = milligram per kilogram-day.
[7] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[8] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
[9] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[10] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
[11] Percent increase in cumulative hazard due to chromium (III).
[12] Percent increase in cumulative risk due to chromium (VI).
[13] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.38
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11	0.000011	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	17700	0.018	0.0010	0.36	N/A	1.0	0.15	0.0020	1.8E-05	--	4.7E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00047	0.97%
Antimony	7440-36-0	49.6 J	0.000050	0.0010	1.21	N/A	1.0	0.51	0.0042	5.0E-08	--	1.3E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.022	45%
Arsenic	7440-38-2	1.7 J	0.0000017	0.0010	0.66	N/A	1.0	0.28	0.0033	1.7E-09	1.6E-08	4.5E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.4E-08	100%	0.00015	0.31%
Barium	7440-39-3	195 J	0.00020	0.0010	1.48	N/A	1.0	0.62	0.0045	2.0E-07	--	5.2E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00037	0.77%
Beryllium	7440-41-7	0.87 J	0.00000087	0.0010	0.28	N/A	1.0	0.12	0.0012	8.7E-10	--	2.3E-08	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0017	3.4%
Cadmium	7440-43-9	3.8 J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	3.8E-09	--	1.0E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0041	8.4%
Cobalt	7440-48-4	11 J	0.000011	0.0004	0.54	N/A	1.0	0.22	0.0012	4.4E-09	--	1.2E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.00039	0.81%
Copper	7440-50-8	79.2	0.000079	0.0010	0.57	N/A	1.0	0.24	0.0031	7.9E-08	--	2.1E-06	1	--	4.0E-02	--	4.0E-02	--	--	0.000053	0.11%
Manganese	7439-96-5	384	0.00038	0.0010	0.51	N/A	1.0	0.21	0.0029	3.8E-07	--	1.0E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.011	22%
Mercury	7487-94-7	1.8	0.0000018	0.0010	8.36	N/A	1.0	3.49	0.0063	1.8E-09	--	4.8E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.0023	4.7%
Nickel	7440-02-0	43.9	0.000044	0.0002	0.54	N/A	1.0	0.22	0.0006	8.8E-09	--	2.3E-07	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00029	0.60%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	29.7 J	0.000030	0.0010	0.49	N/A	1.0	0.20	0.0027	3.0E-08	--	7.9E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0061	13%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	2E-08	100%	0.05	100%
Chromium [19]																					
Chromium (III)	16065-83-1	28.9	0.000029	0.0010	0.49	N/A	1.0	0.21	0.0028	2.9E-08	--	7.7E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000040	0.042% [20]
Chromium (VI)	18540-29-9	28.9	0.000029	0.0020	0.49	N/A	1.0	0.21	0.0055	5.8E-08	5.5E-07	1.5E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	1.1E-05	100% [21]	0.021	22% [22]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	2E-08	--	0.1	--
																	Pathway Sums (including Chromium (VI)):	1E-05	--	0.1	--

Table B.4.38
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) (mg/kg-day)$^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.39

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	11		0.011	9.7E-06	3.8E-05	2.3E-05	1.4E-02	2.0E-02	1.4E-07	5.7%	0.0019	0.24%	0.0011	0.24%
Metals															
Aluminum	7429-90-5	17700		18	--	6.1E-02	3.6E-02	--	1.0E+00	--	--	0.061	7.8%	0.04	7.8%
Antimony	7440-36-0	49.6	J	0.050	--	1.7E-04	1.0E-04	--	4.0E-04	--	--	0.42	55%	0.25	55%
Arsenic	7440-38-2	1.7	J	0.0017	1.5E-06	5.8E-06	3.5E-06	1.5E+00	3.0E-04	2.2E-06	94%	0.019	2.5%	0.012	2.5%
Barium	7440-39-3	195	J	0.20	--	6.7E-04	4.0E-04	--	2.0E-01	--	--	0.0033	0.43%	0.0020	0.43%
Beryllium	7440-41-7	0.87	J	0.00087	--	3.0E-06	1.8E-06	--	2.0E-03	--	--	0.0015	0.19%	0.0009	0.19%
Cadmium	7440-43-9	3.8	J	0.0038	--	1.3E-05	7.8E-06	--	5.0E-04	--	--	0.026	3.4%	0.016	3.37%
Cobalt	7440-48-4	11	J	0.011	--	3.8E-05	2.3E-05	--	3.0E-04	--	--	0.13	16%	0.075	16%
Copper	7440-50-8	79.2		0.079	--	2.7E-04	1.6E-04	--	4.0E-02	--	--	0.0068	0.88%	0.0041	0.88%
Manganese	7439-96-5	384		0.38	--	1.3E-03	7.9E-04	--	2.4E-02	--	--	0.055	7.1%	0.033	7.1%
Mercury	7487-94-7	1.8		0.0018	--	6.2E-06	3.7E-06	--	3.0E-04	--	--	0.021	2.7%	0.012	2.66%
Nickel	7440-02-0	43.9		0.044	--	1.5E-04	9.0E-05	--	2.0E-02	--	--	0.0075	0.97%	0.0045	0.97%
Thallium	7440-28-0	1.2	U	NC	--	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	29.7	J	0.030	--	1.0E-04	6.1E-05	--	5.0E-03	--	--	0.020	2.6%	0.012	2.6%
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	2E-06	100%	0.8	100%	0.5	100%
Chromium (10)															
Chromium (III)	16065-83-1	28.9		0.029	--	9.9E-05	5.9E-05	--	1.5E+00	--	--	0.000066	0.0085% (11)	0.000040	0.0085% (11)
Chromium (VI)	18540-29-9	28.9		0.029	2.5E-05	9.9E-05	5.9E-05	5.0E-01	3.0E-03	1.3E-05	84% (12)	0.033	4.1% (13)	0.020	4.1% (13)
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	2E-06	--	0.8	--	0.5	--
									Pathway Sums:	2E-05	--	0.8	--	0.5	--

Table B.4.39

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.40

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2\,FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event-adjusted} \le$ t*? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] (mg/kg-day)$^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] (mg/kg-day)$^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	11	0.000011	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	17700	0.018	0.0010	0.36	N/A	1.0	0.15	0.0020	1.2E-05	--	5.0E-05	2.2E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000050	0.97%	0.000022	0.97%
Antimony	7440-36-0	49.6 J	0.000050	0.0010	1.21	N/A	1.0	0.51	0.0042	3.3E-08	--	1.4E-07	6.1E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0024	45%	0.0010	45%
Arsenic	7440-38-2	1.7 J	0.0000017	0.0010	0.66	N/A	1.0	0.28	0.0033	1.1E-09	1.0E-09	4.8E-09	2.1E-09	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.5E-09	100%	0.000016	0.31%	0.0000070	0.31%
Barium	7440-39-3	195 J	0.00020	0.0010	1.48	N/A	1.0	0.62	0.0045	1.3E-07	--	5.6E-07	2.4E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000040	0.77%	0.000017	0.77%
Beryllium	7440-41-7	0.87 J	0.00000087	0.0010	0.28	N/A	1.0	0.12	0.0012	5.8E-10	--	2.5E-09	1.1E-09	0.007	--	2.0E-03	--	1.4E-05	--	--	0.00018	3.4%	0.00008	3.4%
Cadmium	7440-43-9	3.8 J	0.0000038	0.0010	1.08	N/A	1.0	0.45	0.0041	2.5E-09	--	1.1E-08	4.7E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00043	8.4%	0.00019	8.4%
Cobalt	7440-48-4	11 J	0.000011	0.0004	0.54	N/A	1.0	0.22	0.0012	3.0E-09	--	1.3E-08	5.4E-09	1	--	3.0E-04	--	3.0E-04	--	--	0.000042	0.81%	0.000018	0.81%
Copper	7440-50-8	79.2	0.000079	0.0010	0.57	N/A	1.0	0.24	0.0031	5.3E-08	--	2.3E-07	9.7E-08	1	--	4.0E-02	--	4.0E-02	--	--	0.0000056	0.11%	0.0000024	0.11%
Manganese	7439-96-5	384	0.00038	0.0010	0.51	N/A	1.0	0.21	0.0029	2.6E-07	--	1.1E-06	4.7E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0011	22%	0.00049	22%
Mercury	7487-94-7	1.8	0.0000018	0.0010	8.36	N/A	1.0	3.49	0.0063	1.2E-09	--	5.1E-09	2.2E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00024	4.7%	0.00011	4.7%
Nickel	7440-02-0	43.9	0.000044	0.0002	0.54	N/A	1.0	0.22	0.0006	5.9E-09	--	2.5E-08	1.1E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000031	0.60%	0.000013	0.60%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	29.7 J	0.000030	0.0010	0.49	N/A	1.0	0.20	0.0027	2.0E-08	--	8.5E-08	3.7E-08	0.026	--	5.0E-03	--	1.3E-04	--	--	0.00065	13%	0.00028	13%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.52E-09	100%	0.01	100%	0.002	100%
Chromium [19]																								
Chromium (III)	16065-83-1	28.9	0.000029	0.0010	0.49	N/A	1.0	0.21	0.0028	1.9E-08	--	8.2E-08	3.6E-08	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000042	0.081% [20]	0.0000018	0.081% [20]
Chromium (VI)	18540-29-9	28.9	0.000029	0.0020	0.49	N/A	1.0	0.21	0.0055	3.9E-08	3.4E-08	1.6E-07	7.1E-08	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	6.9E-07	100% [21]	0.0022	30% [22]	0.00095	30% [22]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	2E-09	--	0.01	--	0.002	--
																		Pathway Sums (including Chromium (VI)):	7E-07	--	0.01	--	0.003	--

Table B.4.40

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value.

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.41

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area-MW 5

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day / year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals															
Aluminum	7429-90-5	821		0.82	--	4.1E-02	2.5E-02	--	1.0E+00	--	--	0.041	1.1%	0.025	1.1%
Antimony	7440-36-0	28.1	J	0.028	--	1.4E-03	8.4E-04	--	4.0E-04	--	--	3.5	95%	2.1	95%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	82.8	J	0.083	--	4.1E-03	2.5E-03	--	2.0E-01	--	--	0.021	0.56%	0.012	0.56%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	NC	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	NC	--	4.0E-02	--	--	--	--	--	--
Manganese (non-diet)	7439-96-5	55		0.055	--	2.7E-03	1.6E-03	--	2.4E-02	--	--	0.11	3.1%	0.069	3.1%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00		4	100%	2	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	J	0.0026	--	1.3E-04	7.8E-05	--	1.5E+00	--	--	0.000086	0.0023% [11]	0.000052	0.0023% [11]
Chromium (VI)	18540-29-9	2.6	J	0.0026	3.3E-05	1.3E-04	7.8E-05	5.0E-01	3.0E-03	1.7E-05	100% [12]	0.043	1.2% [13]	0.026	1.2% [13]
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	0E+00	--	4	--	2	--
									Pathway Sums (including Chromium (VI)):	2E-05	--	4	--	2	--

Table B.4.41

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area-MW 5

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.42
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days/year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days/year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days/year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event\text{-}adjusted} \le$ t*? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	821		0.00082	0.0010	0.36	N/A	1.0	0.15	0.0020	5.5E-07	--	2.2E-04	1.4E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00022	0.15%	0.00014	0.15%
Antimony	7440-36-0	28.1	J	0.000028	0.0010	1.21	N/A	1.0	0.51	0.0042	1.9E-08	--	7.7E-06	4.7E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.13	88%	0.079	88%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	82.8	J	0.000083	0.0010	1.48	N/A	1.0	0.62	0.0045	5.6E-08	--	2.3E-05	1.4E-05	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0016	1.1%	0.0010	1.1%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	55		0.000055	0.0010	0.51	N/A	1.0	0.21	0.0029	3.7E-08	--	1.5E-05	9.2E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.016	11%	0.010	11%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0.0E+00	0%	0.1	100%	0.1	100%
Chromium [19]																									
Chromium (III)	16065-83-1	2.6	J	0.0000026	0.0010	0.49	N/A	1.0	0.21	0.0028	1.7E-09	--	7.1E-07	4.4E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000036	0.025% [20]	0.000022	0.025% [20]
Chromium (VI)	18540-29-9	2.6	J	0.0000026	0.0020	0.49	N/A	1.0	0.21	0.0055	3.5E-09	3.7E-07	1.4E-06	8.7E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	7.4E-06	100% [21]	0.019	12% [22]	0.012	12% [22]
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00	--	0.1	--	0.1	--
																			Pathway Sums (including Chromium (VI)):	7E-06	--	0.2	--	0.1	--

Table B.4.42
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.43

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	821		0.82	--	6.7E-05	--	1.0E+00	--	--	0.000067	1.1%
Antimony	7440-36-0	28.1	J	0.028	--	2.3E-06	--	4.0E-04	--	--	0.0058	95%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	82.8	J	0.083	--	6.8E-06	--	2.0E-01	--	--	0.000034	0.56%
Beryllium	7440-41-7	0.4	U	NC	--	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	--	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	--	NC	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	55		0.055	--	4.5E-06	--	2.4E-02	--	--	0.00019	3.1%
Mercury	7487-94-7	0.04	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	--	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	0E+00		0.01	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	J	0.0026	--	2.1E-07	--	1.5E+00	--	--	0.00000014	0.0023% [11]
Chromium (VI)	18540-29-9	2.6	J	0.0026	3.1E-09	2.1E-07	5.0E-01	3.0E-03	1.5E-09	100% [12]	0.000071	1.2% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	0E+00	--	0.01	--
								Pathway Sums (including Chromium (VI)):	2E-09	--	0.01	--

Table B.4.43

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.44

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

Carcinogenic: $$Risk = DAD \times SF_d$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

for organic compounds:

If $t_{event} \le t^*$, then: $$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

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

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	10 U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	821	0.00082	0.0010	0.36	N/A	1.0	0.15	0.0020	1.6E-06	--	5.85E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.0000059	0.15%
Antimony	7440-36-0	28.1 J	0.000028	0.0010	1.2	N/A	1.0	0.51	0.0042	5.6E-08	--	2.00E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0033	88%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	82.8 J	0.000083	0.0010	1.5	N/A	1.0	0.62	0.0045	1.7E-07	--	5.90E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000042	1.1%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.1 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	4.4 U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1 U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	55	0.000055	0.0010	0.51	N/A	1.0	0.21	0.0029	1.1E-07	--	3.92E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.00041	11%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.4	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4 U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2 U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00	--	0.004	100%
Chromium [19]																					
Chromium (III)	16065-83-1	2.6 J	0.0000026	0.0010	0.49	N/A	1.0	0.21	0.0028	5.2E-09	--	1.85E-08	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000010	0.025% [20]
Chromium (VI)	18540-29-9	2.6 J	0.0000026	0.0020	0.4934691	N/A	1.0	0.21	0.0055	1.0E-08	5.3E-10	0.0000000	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	1.1E-08	100% [21]	0.00049	12% [22]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.004	--
																	Pathway Sums (including Chromium (VI)):	1E-08	--	0.004	--

Table B.4.44

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.45

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	821		0.82	--	1.6E-02	--	1.0E+00	--	--	0.016	1.1%
Antimony	7440-36-0	28.1	J	0.028	--	5.4E-04	--	4.0E-04	--	--	1.4	95%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	82.8	J	0.083	--	1.6E-03	--	2.0E-01	--	--	0.0080	0.56%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	NC	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	55		0.055	--	1.1E-03	--	2.4E-02	--	--	0.044	3.1%
Mercury	7487-94-7	0.04	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	--	2.0E-02	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	0E+00	--	1	100%
Chromium (10)												
Chromium (III)	16065-83-1	2.6	J	0.0026	--	5.0E-05	--	1.5E+00	--	--	0.000033	0.0023% (11)
Chromium (VI)	18540-29-9	2.6	J	0.0026	1.8E-05	5.0E-05	5.0E-01	3.0E-03	8.9E-06	100% (12)	0.017	1.2% (13)
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	0E+00	--	1	--
								Pathway Sums (including Chromium (VI)):	9E-06	--	1	--

Table B.4.45

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.46
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																						
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	NC	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																						
Aluminum	7429-90-5	821		0.00082	0.0010	0.36	N/A	1.0	0.15	0.0020	8.2E-07	--	2.2E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000022	0.15%
Antimony	7440-36-0	28.1	J	0.000028	0.0010	1.21	N/A	1.0	0.51	0.0042	2.8E-08	--	7.5E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.013	88%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	82.8	J	0.000083	0.0010	1.48	N/A	1.0	0.62	0.0045	8.3E-08	--	2.2E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00016	1.1%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	55		0.000055	0.0010	0.51	N/A	1.0	0.21	0.0029	5.5E-08	--	1.5E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0015	11%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																			Cancer Risk		**Hazard Index**	
																		Pathway sums:	0E+00	--	0.01	100%
Chromium (19)																						
Chromium (III)	16065-83-1	2.6	J	0.0000026	0.0010	0.49	N/A	1.0	0.21	0.0028	2.6E-09	--	7.0E-08	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000036	0.020% (20)
Chromium (VI)	18540-29-9	2.6	J	0.0000026	0.0020	0.49	N/A	1.0	0.21	0.0055	5.2E-09	5.0E-08	1.4E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	9.9E-07	100% (21)	0.0019	11% (22)
																			Cancer Risk		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	0E+00	--	0.02	--
																		Pathway Sums (including Chromium (VI)):	1E-06	--	0.02	--

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.47

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals															
Aluminum	7429-90-5	821		0.82	--	2.8E-03	1.7E-03	--	1.0E+00	--	--	0.0028	1.1%	0.0017	1.1%
Antimony	7440-36-0	28.1	J	0.028	--	9.6E-05	5.8E-05	--	4.0E-04	--	--	0.24	95%	0.14	95%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	82.8	J	0.083	--	2.8E-04	1.7E-04	--	2.0E-01	--	--	0.0014	0.56%	0.00085	0.56%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	NC	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	NC	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	55		0.055	--	1.9E-04	1.1E-04	--	2.4E-02	--	--	0.0078	3.1%	0.0047	3.1%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	NC	NC	NC	--	2.0E-02	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00		0.3	100%	0.2	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	J	0.0026	--	8.9E-06	5.3E-06	--	1.5E+00	--	--	0.0000059	0.0023% [11]	0.0000036	0.0023% [11]
Chromium (VI)	18540-29-9	2.6	J	0.0026	2.3E-06	8.9E-06	5.3E-06	5.0E-01	3.0E-03	1.1E-06	100% [12]	0.0030	1.2% [13]	0.0018	1.2% [13]
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00	--	0.3	--	0.2	--
									Pathway Sums:	1E-06	--	0.3	--	0.2	--

Table B.4.47

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.48

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) (mg/kg-day)$^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) (mg/kg-day)$^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	10	U	--	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	821		0.00082	0.0010	0.36	N/A	1.0	0.15	0.0020	5.5E-07	--	2.3E-06	1.0E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.0000023	0.15%	0.0000010	0.15%
Antimony	7440-36-0	28.1	J	0.000028	0.0010	1.21	N/A	1.0	0.51	0.0042	1.9E-08	--	8.0E-08	3.5E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0013	88%	0.00058	88%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	82.8	J	0.000083	0.0010	1.48	N/A	1.0	0.62	0.0045	5.6E-08	--	2.4E-07	1.0E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000017	1.1%	0.0000073	1.1%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	--	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.1	U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	--	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	--	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	55		0.000055	0.0010	0.51	N/A	1.0	0.21	0.0029	3.7E-08	--	1.6E-07	6.8E-08	0.04	--	2.4E-02	--	9.6E-04	--	--	0.00016	11%	0.000070	11%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	--	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	4	U	NC	0.0002	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--	--	--
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	--	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0E+00	--	0.002	100%	0.0007	100%
Chromium (19)																									
Chromium (III)	16065-83-1	2.6	J	0.0000026	0.0010	0.49	N/A	1.0	0.21	0.0028	1.7E-09	--	7.4E-09	3.2E-09	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00000038	0.025% (20)	0.00000016	0.025% (20)
Chromium (VI)	18540-29-9	2.6	J	0.0000026	0.0020	0.49	N/A	1.0	0.21	0.0055	3.5E-09	3.1E-09	1.5E-08	6.4E-09	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	6.2E-08	100% (21)	0.00020	12% (22)	0.000085	12% (22)
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00	--	0.002	--	0.001	--
																			Pathway Sums (including Chromium (VI)):	6E-08	--	0.002	--	0.001	--

Table B.4.48

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 5

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.49

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	23		0.023	3.0E-04	1.1E-03	6.9E-04	1.4E-02	2.0E-02	4.1E-06	100%	0.057	0.87%	0.034	0.87%
Metals															
Aluminum	7429-90-5	42	U	NC	NC	NC	NC	--	1.0E+00	--	--	--	--	--	--
Antimony	7440-36-0	26.8	J	0.0268	--	1.3E-03	8.0E-04	--	4.0E-04	--	--	3.3	50%	2.0	50%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	27.2	J	0.0272	--	1.4E-03	8.2E-04	--	2.0E-01	--	--	0.0068	0.10%	0.0041	0.10%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.9	J	0.0029	--	1.4E-04	8.7E-05	--	5.0E-04	--	--	0.29	4.4%	0.17	4.4%
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	NC	--	4.0E-02	--	--	--	--	--	--
Manganese (non-diet)	7439-96-5	1400		1.4	--	7.0E-02	4.2E-02	--	2.4E-02	--	--	2.9	44%	1.7	44%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	10.2	J	0.0102	--	5.1E-04	3.1E-04	--	2.0E-02	--	--	0.025	0.38%	0.015	0.38%
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	4E-06	100%	7	100%	4	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	NC	--	1.5E+00	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	4E-06	--	7	--	4	--
									Pathway Sums (including Chromium (VI)):	4E-06	--	7	--	4	--

Table B.4.49

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.50
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \leq t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event-adjusted} \leq$ t*? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] (mg/kg-day)$^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] (mg/kg-day)$^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	23		0.000023	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	42	U	NC	0.0010	0.36	N/A	1.0	0.15	0.0020	NC	NC	NC	NC	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--
Antimony	7440-36-0	26.8	J	0.000027	0.0010	1.21	N/A	1.0	0.51	0.0042	1.8E-08	--	7.3E-06	4.5E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.12	22%	0.075	22%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	27.2	J	0.000027	0.0010	1.48	N/A	1.0	0.62	0.0045	1.8E-08	--	7.4E-06	4.6E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00053	0.10%	0.00033	0.10%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.9	J	0.0000029	0.0010	1.08	N/A	1.0	0.45	0.0041	1.9E-09	--	7.9E-07	4.9E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.032	5.7%	0.019	5.7%
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	1400		0.0014	0.0010	0.51	N/A	1.0	0.21	0.0029	9.4E-07	--	3.8E-04	2.4E-04	0.04	--	2.4E-02	--	9.6E-04	--	--	0.40	72%	0.25	72%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	10.2	J	0.000010	0.0002	0.54	N/A	1.0	0.22	0.0006	1.4E-09	--	5.6E-07	3.4E-07	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00070	0.13%	0.00043	0.13%
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0E+00		0.6	100%	0.3	100%
Chromium [19]																									
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00	--	0.6	--	0.3	--
																			Pathway Sums (including Chromium (VI)):	0E+00	--	0.6	--	0.3	--

Table B.4.50
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.51

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake\,/\,RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	23		0.023	2.7E-08	1.9E-06	1.4E-02	2.0E-02	3.8E-10	100%	0.000095	0.87%
Metals												
Aluminum	7429-90-5	42	U	NC	--	NC	--	1.0E+00	--	--	--	--
Antimony	7440-36-0	26.8	J	0.027	--	2.2E-06	--	4.0E-04	--	--	0.0055	50%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	27.2	J	0.027	--	2.2E-06	--	2.0E-01	--	--	0.000011	0.10%
Beryllium	7440-41-7	0.4	U	NC	--	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.9	J	0.0029	--	2.4E-07	--	5.0E-04	--	--	0.00048	4.4%
Cobalt	7440-48-4	4.4	U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	--	NC	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	1400		1.4	--	1.2E-04	--	2.4E-02	--	--	0.0048	44%
Mercury	7487-94-7	0.04	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	10.2	J	0.010	--	8.4E-07	--	2.0E-02	--	--	0.000042	0.38%
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	--	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	4E-10	100%	0.01	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	--	1.5E+00	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	4E-10	--	0.01	--
								Pathway Sums (including Chromium (VI)):	4E-10	--	0.01	--

Table B.4.51
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.52
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm²-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm²
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm³
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm³) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm²-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) (mg/kg-day)⁻¹ (14)	RfDo (15) (mg/kg-day)	SF_d (16) (mg/kg-day)⁻¹	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	23	0.000023	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	42 U	NC	0.0010	0.36	N/A	1.0	0.15	0.0020	NC	NC	NC	1	--	1.0E+00	--	1.0E+00	--	--	--	--
Antimony	7440-36-0	26.8 J	0.000027	0.0010	1.2	N/A	1.0	0.51	0.0042	5.4E-08	--	1.91E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0032	22%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	27.2 J	0.000027	0.0010	1.5	N/A	1.0	0.62	0.0045	5.4E-08	--	1.94E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000014	0.10%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.9 J	0.0000029	0.0010	1.08	N/A	1.0	0.45	0.0041	5.8E-09	--	2.07E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00083	5.7%
Cobalt	7440-48-4	4.4 U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1 U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	1400	0.0014	0.0010	0.51	N/A	1.0	0.21	0.0029	2.8E-06	--	9.98E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.010	72%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.4	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	10.2 J	0.000010	0.0002	0.54	N/A	1.0	0.22	0.0006	4.1E-09	--	1.45E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000018	0.13%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00		0.01	100%
Chromium (19)																					
Chromium (III)	16065-83-1	2.6 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--
Chromium (VI)	18540-29-9	2.6 U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.01	--
																	Pathway Sums (including Chromium (VI)):	0E+00	--	0.01	--

Table B.4.52

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.53

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	23		0.023	1.6E-04	4.4E-04	1.4E-02	2.0E-02	2.2E-06	100.0%	0.022	0.87%
Metals												
Aluminum	7429-90-5	42	U	NC	NC	NC	--	1.0E+00	--	--	--	--
Antimony	7440-36-0	26.8	J	0.027	--	5.2E-04	--	4.0E-04	--	--	1.3	50%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	27.2	J	0.027	--	5.2E-04	--	2.0E-01	--	--	0.0026	0.10%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	--	2.0E-03	--	--	--	--
Cadmium	7440-43-9	2.9	J	0.0029	--	5.6E-05	--	5.0E-04	--	--	0.11	4.4%
Cobalt	7440-48-4	4.4	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	1400		1.4	--	2.7E-02	--	2.4E-02	--	--	1.1	44%
Mercury	7487-94-7	0.04	U	NC	NC	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	10.2	J	0.010	--	2.0E-04	--	2.0E-02	--	--	0.010	0.38%
Thallium	7440-28-0	1.2	U	NC	NC	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	--	5.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	2E-06	100%	3	100%
Chromium [10]												
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	--	1.5E+00	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-06	--	3	--
								Pathway Sums (including Chromium (VI)):	2E-06	--	3	--

[1] COPC = Constituent of potential concern.
[2] CAS = Chemical Abstracts Service number.
[3] Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
[4] µg/L = microgram per liter.
[5] mg/L = milligram per liter.
[6] mg/kg-day = milligram per kilogram-day.
[7] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[8] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
[9] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[10] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.54
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	23	0.000023	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	42 U	NC	0.0010	0.36	N/A	1.0	0.15	0.0020	NC	NC	NC	1	--	1.0E+00	--	1.0E+00	--	--	--	--
Antimony	7440-36-0	26.8 J	0.000027	0.0010	1.21	N/A	1.0	0.51	0.0042	2.7E-08	--	7.2E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.012	22%
Arsenic	7440-38-2	1.4 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	27.2 J	0.000027	0.0010	1.48	N/A	1.0	0.62	0.0045	2.7E-08	--	7.3E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000052	0.10%
Beryllium	7440-41-7	0.4 U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--
Cadmium	7440-43-9	2.9 J	0.0000029	0.0010	1.08	N/A	1.0	0.45	0.0041	2.9E-09	--	7.8E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0031	5.7%
Cobalt	7440-48-4	4.4 U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3.1 U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Manganese	7439-96-5	1400	0.0014	0.0010	0.51	N/A	1.0	0.21	0.0029	1.4E-06	--	3.7E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.039	72%
Mercury	7487-94-7	0.04 U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	10.2 J	0.000010	0.0002	0.54	N/A	1.0	0.22	0.0006	2.0E-09	--	5.5E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000068	0.13%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	3.7 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00	--	0.05	100%
Chromium [19]																					
Chromium (III)	16065-83-1	2.6 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--
Chromium (VI)	18540-29-9	2.6 U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.1	--
																	Pathway Sums (including Chromium (VI)):	0E+00	--	0.1	--

Table B.4.54
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.55

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	23		0.023	2.0E-05	7.9E-05	4.7E-05	1.4E-02	2.0E-02	2.8E-07	100%	0.0039	0.87%	0.0024	0.87%
Metals															
Aluminum	7429-90-5	42	U	NC	NC	NC	NC	--	1.0E+00	--	--	--	--	--	--
Antimony	7440-36-0	26.8	J	0.027	--	9.2E-05	5.5E-05	--	4.0E-04	--	--	0.23	50%	0.14	50%
Arsenic	7440-38-2	1.4	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	27.2	J	0.027	--	9.3E-05	5.6E-05	--	2.0E-01	--	--	0.00047	0.10%	0.00028	0.10%
Beryllium	7440-41-7	0.4	U	NC	NC	NC	NC	--	2.0E-03	--	--	--	--	--	--
Cadmium	7440-43-9	2.9	J	0.0029	--	9.9E-06	6.0E-06	--	5.0E-04	--	--	0.020	4.4%	0.012	4.4%
Cobalt	7440-48-4	4.4	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	NC	NC	NC	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	1400		1.4	--	4.8E-03	2.9E-03	--	2.4E-02	--	--	0.20	44%	0.12	44%
Mercury	7487-94-7	0.04	U	NC	NC	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	10.2	J	0.010	--	3.5E-05	2.1E-05	--	2.0E-02	--	--	0.0017	0.38%	0.0010	0.38%
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	NC	NC	NC	--	5.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	3E-07	100%	0.5	100%	0.3	100%
Chromium [10]															
Chromium (III)	16065-83-1	2.6	U	NC	NC	NC	NC	--	1.5E+00	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	--	--	--	--	--
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	3E-07	--	0.5	--	0.3	--
									Pathway Sums:	3E-07	--	0.5	--	0.3	--

Table B.4.55

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.56

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event\text{-}adjusted} \le$ t*? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	23		0.000023	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	42	U	NC	0.0010	0.36	N/A	1.0	0.15	0.0020	NC	NC	NC	NC	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--
Antimony	7440-36-0	26.8	J	0.0000268	0.0010	1.21	N/A	1.0	0.51	0.0042	1.8E-08	--	7.6E-08	3.3E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0013	22%	0.00055	22%
Arsenic	7440-38-2	1.4	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	NC	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	27.2	J	0.0000272	0.0010	1.48	N/A	1.0	0.62	0.0045	1.8E-08	--	7.8E-08	3.3E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0000055	0.10%	0.0000024	0.10%
Beryllium	7440-41-7	0.4	U	NC	0.0010	0.28	N/A	1.0	0.12	0.0012	NC	NC	NC	NC	0.007	--	2.0E-03	--	1.4E-05	--	--	--	--	--	--
Cadmium	7440-43-9	2.9	J	0.0000029	0.0010	1.08	N/A	1.0	0.45	0.0041	1.9E-09	--	8.3E-09	3.6E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00033	5.7%	0.00014	5.7%
Cobalt	7440-48-4	4.4	U	NC	0.0004	0.54	N/A	1.0	0.22	0.0012	NC	NC	NC	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3.1	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	NC	NC	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--	--	--
Manganese	7439-96-5	1400		0.0014	0.0010	0.51	N/A	1.0	0.21	0.0029	9.4E-07	--	4.0E-06	1.7E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0042	72%	0.0018	72%
Mercury	7487-94-7	0.04	U	NC	0.0010	8.36	N/A	1.0	3.49	0.0063	NC	NC	NC	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	10.2	J	0.0000102	0.0002	0.54	N/A	1.0	0.22	0.0006	1.4E-09	--	5.8E-09	2.5E-09	0.04	--	2.0E-02	--	8.0E-04	--	--	0.0000073	0.13%	0.0000031	0.13%
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	3.7	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	NC	NC	NC	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	0E+00	--	0.01	100%	0.002	100%
Chromium (19)																									
Chromium (III)	16065-83-1	2.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	NC	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	2.6	U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	0E+00	--	0.01	--	0.002	--
																			Pathway Sums (including Chromium (VI)):	0E+00	--	0.01	--	0.002	--

Table B.4.56

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-2

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value.

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.57

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area-45-3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds															
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals															
Aluminum	7429-90-5	7510		7.5	--	3.7E-01	2.3E-01	--	1.0E+00	--	--	0.37	3.9%	0.23	3.9%
Antimony	7440-36-0	36.7	J	0.037	--	1.8E-03	1.1E-03	--	4.0E-04	--	--	4.6	48%	2.7	48%
Arsenic	7440-38-2	1.8	J	0.0018	2.3E-05	9.0E-05	5.4E-05	1.5E+00	3.0E-04	3.5E-05	100%	0.3	3.1%	0.18	3.1%
Barium	7440-39-3	62.1	J	0.062	--	3.1E-03	1.9E-03	--	2.0E-01	--	--	0.015	0.16%	0.01	0.16%
Beryllium	7440-41-7	0.52	J	0.00052	--	2.6E-05	1.6E-05	--	2.0E-03	--	--	0.013	0.14%	0.008	0.14%
Cadmium	7440-43-9	3.2	J	0.0032	--	1.6E-04	9.6E-05	--	5.0E-04	--	--	0.32	3.34%	0.19	3.3%
Cobalt	7440-48-4	14.6	J	0.015	--	7.3E-04	4.4E-04	--	3.0E-04	--	--	2.4	25%	1.5	25%
Copper	7440-50-8	11.9	J	0.012	--	5.9E-04	3.6E-04	--	4.0E-02	--	--	0.015	0.16%	0.009	0.16%
Manganese (non-diet)	7439-96-5	625		0.63	--	3.1E-02	1.9E-02	--	2.4E-02	--	--	1.3	14%	0.8	13.61%
Mercury	7487-94-7	0.08	J	0.000080	--	4.0E-06	2.4E-06	--	3.0E-04	--	--	0.013	0.14%	0.01	0.14%
Nickel	7440-02-0	30.7	J	0.031	--	1.5E-03	9.2E-04	--	2.0E-02	--	--	0.077	0.80%	0.046	0.80%
Thallium	7440-28-0	1.2	U	NC	NC	NC	NC	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	11.7	J	0.012	--	5.8E-04	3.5E-04	--	5.0E-03	--	--	0.12	1.2%	0.070	1.2%
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	3E-05	100%	10	100%	6	100%
Chromium [10]															
Chromium (III)	16065-83-1	16.1		0.016	--	8.0E-04	4.8E-04	--	1.5E+00	--	--	0.00054	0.0056% [11]	0.00032	0.0056% [11]
Chromium (VI)	18540-29-9	16.1		0.016	2.1E-04	8.0E-04	4.8E-04	5.0E-01	3.0E-03	1.0E-04	75% [12]	0.27	2.7% [13]	0.16	2.7% [13]
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums (including Chromium(III)):	3E-05	--	10	--	6	--
									Pathway Sums (including Chromium (VI)):	1E-04	--	10	--	6	--

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.58
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) $[(t_{event}$ - child * $ED_c)+(t_{event}$ - adult * $ED_a)$ / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event\text{-}adjusted} \le$ t*? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	7510	0.0075	0.0010	0.36	N/A	1.0	0.15	0.0020	5.0E-06	--	2.1E-03	1.3E-03	1	--	1.0E+00	--	1.0E+00	--	--	0.0021	0.48%	0.0013	0.48%
Antimony	7440-36-0	36.7 J	0.000037	0.0010	1.21	N/A	1.0	0.51	0.0042	2.5E-08	--	1.0E-05	6.2E-06	0.15	--	4.0E-04	--	6.0E-05	--	--	0.17	39%	0.10	39%
Arsenic	7440-38-2	1.8 J	0.0000018	0.0010	0.66	N/A	1.0	0.28	0.0033	1.2E-09	1.3E-07	4.9E-07	3.0E-07	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.9E-07	100%	0.0016	0.38%	0.0010	0.38%
Barium	7440-39-3	62.1 J	0.000062	0.0010	1.48	N/A	1.0	0.62	0.0045	4.2E-08	--	1.7E-05	1.0E-05	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0012	0.28%	0.00075	0.28%
Beryllium	7440-41-7	0.52 J	0.00000052	0.0010	0.28	N/A	1.0	0.12	0.0012	3.5E-10	--	1.4E-07	8.7E-08	0.007	--	2.0E-03	--	1.4E-05	--	--	0.010	2.4%	0.0062	2.4%
Cadmium	7440-43-9	3.2 J	0.0000032	0.0010	1.08	N/A	1.0	0.45	0.0041	2.1E-09	--	8.8E-07	5.4E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.035	8.2%	0.022	8.2%
Cobalt	7440-48-4	14.6 J	0.000015	0.0004	0.54	N/A	1.0	0.22	0.0012	3.9E-09	--	1.6E-06	9.8E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.0053	1.2%	0.0033	1.2%
Copper	7440-50-8	11.9 J	0.000012	0.0010	0.57	N/A	1.0	0.24	0.0031	8.0E-09	--	3.3E-06	2.0E-06	1	--	4.0E-02	--	4.0E-02	--	--	0.000081	0.019%	0.000050	0.019%
Manganese	7439-96-5	625	0.00063	0.0010	0.51	N/A	1.0	0.21	0.0029	4.2E-07	--	1.7E-04	1.1E-04	0.04	--	2.4E-02	--	9.6E-04	--	--	0.18	42%	0.109	42%
Mercury	7487-94-7	0.08 J	0.000000080	0.0010	8.36	N/A	1.0	3.49	0.0063	5.4E-11	--	2.2E-08	1.3E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.0010	0.24%	0.00064	0.24%
Nickel	7440-02-0	30.7 J	0.000031	0.0002	0.54	N/A	1.0	0.22	0.0006	4.1E-09	--	1.7E-06	1.0E-06	0.04	--	2.0E-02	--	8.0E-04	--	--	0.0021	0.49%	0.0013	0.49%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	11.7 J	0.000012	0.0010	0.49	N/A	1.0	0.20	0.0027	7.8E-09	--	3.2E-06	2.0E-06	0.026	--	5.0E-03	--	1.3E-04	--	--	0.025	5.74%	0.015	5.7%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.9E-07	100%	0.4	100%	0.3	100%
Chromium [19]																								
Chromium (III)	16065-83-1	16.1	0.000016	0.0010	0.49	N/A	1.0	0.21	0.0028	1.1E-08	--	4.4E-06	2.7E-06	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00023	-- [20]	0.00014	-- [20]
Chromium (VI)	18540-29-9	16.1	0.000016	0.0020	0.49	N/A	1.0	0.21	0.0055	2.2E-08	2.3E-06	8.8E-06	5.4E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	4.6E-05	100% [21]	0.12	22% [22]	0.07	22% [22]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	2E-07	--	0.4	--	0.3	--
																		Pathway Sums (including Chromium (VI)):	5E-05	--	0.5	--	0.3	--

Table B.4.58
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.59
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	7510		7.5	--	6.2E-04	--	1.0E+00	--	--	0.00062	3.9%
Antimony	7440-36-0	36.7	J	0.037	--	3.0E-06	--	4.0E-04	--	--	0.0075	48%
Arsenic	7440-38-2	1.8	J	0.0018	2.1E-09	1.5E-07	1.5E+00	3.0E-04	3.2E-09	100.0%	0.00049	3.1%
Barium	7440-39-3	62.1	J	0.062	--	5.1E-06	--	2.0E-01	--	--	0.000026	0.16%
Beryllium	7440-41-7	0.52	J	0.00052	--	4.3E-08	--	2.0E-03	--	--	0.000021	0.14%
Cadmium	7440-43-9	3.2	J	0.0032	--	2.6E-07	--	5.0E-04	--	--	0.00053	3.3%
Cobalt	7440-48-4	14.6	J	0.015	--	1.2E-06	--	3.0E-04	--	--	0.0040	25%
Copper	7440-50-8	11.9	J	0.012	--	9.8E-07	--	4.0E-02	--	--	0.000024	0.16%
Manganese	7439-96-5	625		0.63	--	5.1E-05	--	2.4E-02	--	--	0.0021	14%
Mercury	7487-94-7	0.08	J	0.000080	--	6.6E-09	--	3.0E-04	--	--	0.000022	0.14%
Nickel	7440-02-0	30.7	J	0.031	--	2.5E-06	--	2.0E-02	--	--	0.00013	0.80%
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	11.7	J	0.012	--	9.6E-07	--	5.0E-03	--	--	0.00019	1.2%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	3E-09	100%	0.02	100%
Chromium (10)												
Chromium (III)	16065-83-1	16.1		0.016	--	1.3E-06	--	1.5E+00	--	--	0.00000088	0.0056% (11)
Chromium (VI)	18540-29-9	16.1		0.016	1.9E-08	1.3E-06	5.0E-01	3.0E-03	9.5E-09	75% (12)	0.00044	2.7% (13)
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	3E-09	--	0.02	--
								Pathway Sums (including Chromium (VI)):	1E-08	--	0.02	--

Table B.4.59

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.60

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	7510	0.0075	0.0010	0.36	N/A	1.0	0.15	0.0020	1.5E-05	--	5.35E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000054	0.48%
Antimony	7440-36-0	36.7 J	0.000037	0.0010	1.2	N/A	1.0	0.51	0.0042	7.3E-08	--	2.62E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0044	39%
Arsenic	7440-38-2	1.8 J	0.0000018	0.0010	0.66	N/A	1.0	0.28	0.0033	3.6E-09	1.8E-10	1.28E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.8E-10	100%	0.000043	0.38%
Barium	7440-39-3	62.1 J	0.000062	0.0010	1.5	N/A	1.0	0.62	0.0045	1.2E-07	--	4.43E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000032	0.28%
Beryllium	7440-41-7	0.52 J	0.00000052	0.0010	0.28	N/A	1.0	0.12	0.0012	1.0E-09	--	3.71E-09	0.007	--	2.0E-03	--	1.4E-05	--	--	0.00026	2.4%
Cadmium	7440-43-9	3.2 J	0.0000032	0.0010	1.08	N/A	1.0	0.45	0.0041	6.4E-09	--	2.28E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00091	8.2%
Cobalt	7440-48-4	14.6 J	0.000015	0.0004	0.54	N/A	1.0	0.22	0.0012	1.2E-08	--	4.16E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.00014	1.2%
Copper	7440-50-8	11.9 J	0.000012	0.0010	0.57	N/A	1.0	0.24	0.0031	2.4E-08	--	8.48E-08	1	--	4.0E-02	--	4.0E-02	--	--	0.0000021	0.019%
Manganese	7439-96-5	625	0.00063	0.0010	0.51	N/A	1.0	0.21	0.0029	1.3E-06	--	4.46E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0046	42%
Mercury	7487-94-7	0.08 J	0.00000008	0.0010	8.4	N/A	1.0	3.49	0.0063	1.6E-10	--	5.70E-10	0.07	--	3.0E-04	--	2.1E-05	--	--	0.000027	0.24%
Nickel	7440-02-0	30.7 J	0.000031	0.0002	0.54	N/A	1.0	0.22	0.0006	1.2E-08	--	4.38E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000055	0.49%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.5	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	11.7 J	0.000012	0.0010	0.49	N/A	1.0	0.20	0.0027	2.3E-08	--	8.34E-08	0.026	--	5.0E-03	--	1.3E-04	--	--	0.00064	5.7%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	3E-10	100%	0.01	100%
Chromium (19)																					
Chromium (III)	16065-83-1	16.1	0.000016	0.0010	0.49	N/A	1.0	0.21	0.0028	3.2E-08	--	1.15E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000059	0.053% (20)
Chromium (VI)	18540-29-9	16.1	0.000016	0.0020	0.49	N/A	1.0	0.21	0.0055	6.4E-08	3.3E-09	0.0000002	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	6.6E-08	100% (21)	0.0031	22% (22)
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	3E-10	--	0.01	--
																	Pathway Sums (including Chromium (VI)):	7E-08	--	0.01	--

Table B.4.60

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.61
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

Exposure Assumptions			Equations
Receptor	FUTURE PARK WORKER		
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L	$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$
Groundwater Ingestion Rate, (IRW)	2.5	L/day	
Exposure Frequency (EF)	225	days/yr	
Exposure Duration, (ED)	25	yrs	
Averaging Time, Carcinogens (AT_c)	70	yrs	
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs	
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$	
Body Weight, adult (BW_a)	80	kg	Carcinogenic: $$Risk = Intake \times SF_o$$
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day	
			Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	7510		7.5	--	1.4E-01	--	1.0E+00	--	--	0.14	3.9%
Antimony	7440-36-0	36.7	J	0.037	--	7.1E-04	--	4.0E-04	--	--	1.8	48%
Arsenic	7440-38-2	1.8	J	0.0018	1.2E-05	3.5E-05	1.5E+00	3.0E-04	1.9E-05	100%	0.12	3.1%
Barium	7440-39-3	62.1	J	0.062	--	1.2E-03	--	2.0E-01	--	--	0.0060	0.16%
Beryllium	7440-41-7	0.52	J	0.00052	--	1.0E-05	--	2.0E-03	--	--	0.0050	0.14%
Cadmium	7440-43-9	3.2	J	0.0032	--	6.2E-05	--	5.0E-04	--	--	0.12	3.34%
Cobalt	7440-48-4	14.6	J	0.015	--	2.8E-04	--	3.0E-04	--	--	0.94	25%
Copper	7440-50-8	11.9	J	0.012	--	2.3E-04	--	4.0E-02	--	--	0.0057	0.16%
Manganese	7439-96-5	625		0.63	--	1.2E-02	--	2.4E-02	--	--	0.50	14%
Mercury	7487-94-7	0.08	J	0.000080	--	1.5E-06	--	3.0E-04	--	--	0.005	0.14%
Nickel	7440-02-0	30.7	J	0.031	--	5.9E-04	--	2.0E-02	--	--	0.030	0.80%
Thallium	7440-28-0	1.2	U	NC	--	NC	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	11.7	J	0.012	--	2.3E-04	--	5.0E-03	--	--	0.045	1.2%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	2E-05	100%	4	100%
Chromium [10]												
Chromium (III)	16065-83-1	16.1		0.016	--	3.1E-04	--	1.5E+00	--	--	0.00021	0.0056% [11]
Chromium (VI)	18540-29-9	16.1		0.016	1.1E-04	3.1E-04	5.0E-01	3.0E-03	5.5E-05	75% [12]	0.10	2.7% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-05	--	4	--
								Pathway Sums (including Chromium (VI)):	7E-05	--	4	--

Table B.4.61

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.62
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	7510	0.0075	0.0010	0.36	N/A	1.0	0.15	0.0020	7.5E-06	--	2.0E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00020	0.48%
Antimony	7440-36-0	36.7 J	0.000037	0.0010	1.21	N/A	1.0	0.51	0.0042	3.7E-08	--	9.8E-07	0.15	--	4.0E-04	--	6.0E-05	--	--	0.016	39%
Arsenic	7440-38-2	1.8 J	0.0000018	0.0010	0.66	N/A	1.0	0.28	0.0033	1.8E-09	1.7E-08	4.8E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.6E-08	100%	0.00016	0.38%
Barium	7440-39-3	62.1 J	0.000062	0.0010	1.48	N/A	1.0	0.62	0.0045	6.2E-08	--	1.7E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00012	0.28%
Beryllium	7440-41-7	0.52 J	0.00000052	0.0010	0.28	N/A	1.0	0.12	0.0012	5.2E-10	--	1.4E-08	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0010	2.4%
Cadmium	7440-43-9	3.2 J	0.0000032	0.0010	1.08	N/A	1.0	0.45	0.0041	3.2E-09	--	8.6E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0034	8.2%
Cobalt	7440-48-4	14.6 J	0.000015	0.0004	0.54	N/A	1.0	0.22	0.0012	5.8E-09	--	1.6E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.00052	1.2%
Copper	7440-50-8	11.9 J	0.000012	0.0010	0.57	N/A	1.0	0.24	0.0031	1.2E-08	--	3.2E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.0000080	0.019%
Manganese	7439-96-5	625	0.00063	0.0010	0.51	N/A	1.0	0.21	0.0029	6.3E-07	--	1.7E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.017	42%
Mercury	7487-94-7	0.08 J	0.000000080	0.0010	8.36	N/A	1.0	3.49	0.0063	8.0E-11	--	2.1E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00010	0.24%
Nickel	7440-02-0	30.7 J	0.000031	0.0002	0.54	N/A	1.0	0.22	0.0006	6.1E-09	--	1.6E-07	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00021	0.49%
Thallium	7440-28-0	1.2 U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--
Vanadium	7440-62-2	11.7 J	0.000012	0.0010	0.49	N/A	1.0	0.20	0.0027	1.2E-08	--	3.1E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0024	5.7%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	3E-08	100%	0.04	100%
Chromium [19]																					
Chromium (III)	16065-83-1	16.1	0.000016	0.0010	0.49	N/A	1.0	0.21	0.0028	1.6E-08	--	4.3E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000022	0.028% [20]
Chromium (VI)	18540-29-9	16.1	0.000016	0.0020	0.49	N/A	1.0	0.21	0.0055	3.2E-08	3.1E-07	8.6E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	6.1E-06	100% [21]	0.011	15% [22]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	3E-08	--	0.08	--
																	Pathway Sums (including Chromium (VI)):	6E-06	--	0.08	--

Table B.4.62
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.63

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds														
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	7510	7.5	--	2.6E-02	1.5E-02	--	1.0E+00	--	--	0.026	3.9%	0.015	3.9%
Antimony	7440-36-0	36.7 J	0.037	--	1.3E-04	7.5E-05	--	4.0E-04	--	--	0.31	47.9%	0.19	48%
Arsenic	7440-38-2	1.8 J	0.0018	1.6E-06	6.2E-06	3.7E-06	1.5E+00	3.0E-04	2.4E-06	100%	0.021	3.1%	0.012	3.1%
Barium	7440-39-3	62.1 J	0.062	--	2.1E-04	1.3E-04	--	2.0E-01	--	--	0.0011	0.16%	0.00064	0.16%
Beryllium	7440-41-7	0.52 J	0.00052	--	1.8E-06	1.1E-06	--	2.0E-03	--	--	0.00089	0.14%	0.00053	0.14%
Cadmium	7440-43-9	3.2 J	0.0032	--	1.1E-05	6.6E-06	--	5.0E-04	--	--	0.022	3.3%	0.013	3.3%
Cobalt	7440-48-4	14.6 J	0.015	--	5.0E-05	3.0E-05	--	3.0E-04	--	--	0.17	25%	0.10	25%
Copper	7440-50-8	11.9 J	0.012	--	4.1E-05	2.4E-05	--	4.0E-02	--	--	0.0010	0.16%	0.00061	0.16%
Manganese	7439-96-5	625	0.63	--	2.1E-03	1.3E-03	--	2.4E-02	--	--	0.089	14%	0.054	14%
Mercury	7487-94-7	0.08 J	0.000080	--	2.7E-07	1.6E-07	--	3.0E-04	--	--	0.0009	0.14%	0.00055	0.14%
Nickel	7440-02-0	30.7 J	0.031	--	1.0E-04	6.3E-05	--	2.0E-02	--	--	0.0052	0.80%	0.0032	0.80%
Thallium	7440-28-0	1.2 U	NC	--	NC	NC	NC	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	11.7 J	0.012	--	4.0E-05	2.4E-05	--	5.0E-03	--	--	0.0080	1.2%	0.0048	1.2%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	2E-06	100%	0.7	100%	0.4	100%
Chromium (10)														
Chromium (III)	16065-83-1	16.1	0.016	--	5.5E-05	3.3E-05	--	1.5E+00	--	--	0.000037	0.0056% (11)	0.00002	0.0056% (11)
Chromium (VI)	18540-29-9	16.1	0.016	1.4E-05	5.5E-05	3.3E-05	5.0E-01	3.0E-03	7.1E-06	75% (12)	0.018	2.7% (13)	0.011	2.7% (13)
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	2E-06	--	0.7	--	0.4	--
								Pathway Sums:	9E-06	--	0.7	--	0.4	--

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.64

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD \ / \ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event\text{-}adjusted} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																									
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	--	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																									
Aluminum	7429-90-5	7510		0.0075	0.0010	0.36	N/A	1.0	0.15	0.0020	5.0E-06	--	2.1E-05	9.2E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.000021	0.48%	0.0000092	0.48%
Antimony	7440-36-0	36.7	J	0.000037	0.0010	1.21	N/A	1.0	0.51	0.0042	2.5E-08	--	1.0E-07	4.5E-08	0.15	--	4.0E-04	--	6.0E-05	--	--	0.0017	39%	0.00075	39%
Arsenic	7440-38-2	1.8	J	0.0000018	0.0010	0.66	N/A	1.0	0.28	0.0033	1.2E-09	1.1E-09	5.1E-09	2.2E-09	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.6E-09	100%	0.000017	0.38%	0.0000074	0.38%
Barium	7440-39-3	62.1	J	0.000062	0.0010	1.48	N/A	1.0	0.62	0.0045	4.2E-08	--	1.8E-07	7.6E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000013	0.28%	0.0000055	0.28%
Beryllium	7440-41-7	0.52	J	0.00000052	0.0010	0.28	N/A	1.0	0.12	0.0012	3.5E-10	--	1.5E-09	6.4E-10	0.007	--	2.0E-03	--	1.4E-05	--	--	0.00011	2.4%	0.000046	2.37%
Cadmium	7440-43-9	3.2	J	0.0000032	0.0010	1.08	N/A	1.0	0.45	0.0041	2.1E-09	--	9.1E-09	3.9E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00037	8.2%	0.00016	8.2%
Cobalt	7440-48-4	14.6	J	0.000015	0.0004	0.54	N/A	1.0	0.22	0.0012	3.9E-09	--	1.7E-08	7.2E-09	1	--	3.0E-04	--	3.0E-04	--	--	0.000056	1.2%	0.000024	1.2%
Copper	7440-50-8	11.9	J	0.000012	0.0010	0.57	N/A	1.0	0.24	0.0031	8.0E-09	--	3.4E-08	1.5E-08	1	--	4.0E-02	--	4.0E-02	--	--	0.00000085	0.019%	0.00000037	0.019%
Manganese	7439-96-5	625		0.00063	0.0010	0.51	N/A	1.0	0.21	0.0029	4.2E-07	--	1.8E-06	7.7E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0019	42%	0.00080	42%
Mercury	7487-94-7	0.08	J	0.000000080	0.0010	8.36	N/A	1.0	3.49	0.0063	5.4E-11	--	2.3E-10	9.8E-11	0.07	--	3.0E-04	--	2.1E-05	--	--	0.000011	0.24%	0.0000047	0.24%
Nickel	7440-02-0	30.7	J	0.000031	0.0002	0.54	N/A	1.0	0.22	0.0006	4.1E-09	--	1.8E-08	7.5E-09	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000022	0.49%	0.0000094	0.49%
Thallium	7440-28-0	1.2	U	NC	0.0010	3.52	N/A	1.0	1.47	0.0055	NC	NC	NC	NC	1	--	1.0E-05	--	1.0E-05	--	--	--	--	--	--
Vanadium	7440-62-2	11.7	J	0.000012	0.0010	0.49	N/A	1.0	0.20	0.0027	7.8E-09	--	3.3E-08	1.4E-08	0.026	--	5.0E-03	--	1.3E-04	--	--	0.00026	5.7%	0.00011	5.7%
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	2E-09	100%	0.004	100%	0.002	100%
Chromium [19]																									
Chromium (III)	16065-83-1	16.1		0.000016	0.0010	0.49	N/A	1.0	0.21	0.0028	1.1E-08	--	4.6E-08	2.0E-08	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0000024	0.053% [20]	0.0000010	0.053% [20]
Chromium (VI)	18540-29-9	16.1		0.000016	0.0020	0.49	N/A	1.0	0.21	0.0055	2.2E-08	1.9E-08	9.2E-08	4.0E-08	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	3.8E-07	99.6% [21]	0.0012	22% [22]	0.00053	22% [22]
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	2E-09		0.004		0.002	
																			Pathway Sums (including Chromium (VI)):	4E-07		0.006		0.002	

Table B.4.64
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-3
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value.
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.65

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	350	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds														
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	63300	63	--	3.2E+00	1.9E+00	--	1.0E+00	--	--	3.2	6.4%	1.9	6.4%
Antimony	7440-36-0	21.6 UJ	NC	NC	NC	NC	--	4.0E-04	--	--	--	--	--	--
Arsenic	7440-38-2	9.5 J	0.0095	1.2E-04	4.7E-04	2.8E-04	1.5E+00	3.0E-04	1.8E-04	100%	1.6	3.2%	0.95	3.2%
Barium	7440-39-3	751	0.75	--	3.7E-02	2.3E-02	--	2.0E-01	--	--	0.19	0.38%	0.11	0.38%
Beryllium	7440-41-7	5	0.0050	--	2.5E-04	1.5E-04	--	2.0E-03	--	--	0.12	0.25%	0.075	0.25%
Cadmium	7440-43-9	4 U	NC	NC	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	94.4	0.094	--	4.7E-03	2.8E-03	--	3.0E-04	--	--	16	32%	9.4	32%
Copper	7440-50-8	123	0.12	--	6.1E-03	3.7E-03	--	4.0E-02	--	--	0.15	0.31%	0.092	0.31%
Manganese (non-diet)	7439-96-5	4640	4.6	--	2.3E-01	1.4E-01	--	2.4E-02	--	--	9.6	20%	5.8	19.68%
Mercury	7487-94-7	0.29	0.00029	--	1.4E-05	8.7E-06	--	3.0E-04	--	--	0.048	0.10%	0.029	0.10%
Nickel	7440-02-0	209	0.21	--	1.0E-02	6.3E-03	--	2.0E-02	--	--	0.52	1.06%	0.31	1.06%
Thallium	7440-28-0	3.4 J	0.0034	--	1.7E-04	1.0E-04	--	1.0E-05	--	--	17	35%	10	35%
Vanadium	7440-62-2	93.1	0.093	--	4.6E-03	2.8E-03	--	5.0E-03	--	--	0.93	1.9%	0.56	1.9%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	2E-04	100%	49	100%	29	100%
Chromium (10)														
Chromium (III)	16065-83-1	106	0.11	--	5.3E-03	3.2E-03	--	1.5E+00	--	--	0.0035	0.0072% (11)	0.0021	0.0072% (11)
Chromium (VI)	18540-29-9	106	0.11	1.4E-03	5.3E-03	3.2E-03	5.0E-01	3.0E-03	6.8E-04	79% (12)	1.8	3.5% (13)	1.1	3.5% (13)
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-04	--	49	--	29	--
								Pathway Sums (including Chromium (VI)):	9E-04	--	51	--	30	--

Table B.4.65

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.66
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	2,721,670	events-cm^2/kg
Exposure Frequency (EF)	350	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	6378	cm^2
Exposed Skin Surface Area, adult (SA_a)	20900	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \leq t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event-adjusted} \leq$ t*? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] (mg/kg-day)$^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] (mg/kg-day)$^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	63300	0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	4.2E-05	--	1.7E-02	1.1E-02	1	--	1.0E+00	--	1.0E+00	--	--	0.017	0.96%	0.011	0.96%
Antimony	7440-36-0	21.6 UJ	NC	0.0010	1.21	N/A	1.0	0.51	0.0042	NC	NC	NC	NC	0.15	--	4.0E-04	--	6.0E-05	--	--	--	--	--	--
Arsenic	7440-38-2	9.5 J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	6.4E-09	6.8E-07	2.6E-06	1.6E-06	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.0E-06	100%	0.0087	0.48%	0.0053	0.48%
Barium	7440-39-3	751	0.00075	0.0010	1.48	N/A	1.0	0.62	0.0045	5.0E-07	--	2.1E-04	1.3E-04	0.07	--	2.0E-01	--	1.4E-02	--	--	0.015	0.81%	0.0090	0.81%
Beryllium	7440-41-7	5	0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	3.4E-09	--	1.4E-06	8.4E-07	0.007	--	2.0E-03	--	1.4E-05	--	--	0.098	5.42%	0.060	5.4%
Cadmium	7440-43-9	4 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	94.4	0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	2.5E-08	--	1.0E-05	6.3E-06	1	--	3.0E-04	--	3.0E-04	--	--	0.034	1.9%	0.021	1.9%
Copper	7440-50-8	123	0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	8.3E-08	--	3.4E-05	2.1E-05	1	--	4.0E-02	--	4.0E-02	--	--	0.00084	0.047%	0.00052	0.047%
Manganese	7439-96-5	4640	0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	3.1E-06	--	1.3E-03	7.8E-04	0.04	--	2.4E-02	--	9.6E-04	--	--	1.3	73%	0.81	73%
Mercury	7487-94-7	0.29	0.00000029	0.0010	8.36	N/A	1.0	3.49	0.0063	1.9E-10	--	7.9E-08	4.9E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.0038	0.21%	0.0023	0.21%
Nickel	7440-02-0	209	0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	2.8E-08	--	1.1E-05	7.0E-06	0.04	--	2.0E-02	--	8.0E-04	--	--	0.014	0.79%	0.0088	0.79%
Thallium	7440-28-0	3.4 J	0.0000034	0.0010	3.52	N/A	1.0	1.47	0.0055	2.3E-09	--	9.3E-07	5.7E-07	1	--	1.0E-05	--	1.0E-05	--	--	0.093	5.2%	0.057	5.2%
Vanadium	7440-62-2	93.1	0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	6.2E-08	--	2.5E-05	1.6E-05	0.026	--	5.0E-03	--	1.3E-04	--	--	0.20	11%	0.12	11%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.0E-06	100%	2	100%	1	100%
Chromium [19]																								
Chromium (III)	16065-83-1	106	0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	7.1E-08	--	2.9E-05	1.8E-05	0.013	--	1.5E+00	--	2.0E-02	--	--	0.0015	0.082% [20]	0.00091	0.082% [20]
Chromium (VI)	18540-29-9	106	0.00011	0.0020	0.49	N/A	1.0	0.21	0.0055	1.4E-07	1.5E-05	5.8E-05	3.6E-05	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	3.0E-04	100% [21]	0.77	30% [22]	0.47	30% [22]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	1E-06	--	2	--	1	--
																		Pathway Sums (including Chromium (VI)):	3E-04	--	3	--	2	--

Table B.4.66
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorption value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-
(14) (mg/kg-day)$^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.67

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, adult (IRW_a)	0.08	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	63300		63	--	5.2E-03	--	1.0E+00	--	--	0.0052	6.4%
Antimony	7440-36-0	21.6	UJ	NC	--	NC	--	4.0E-04	--	--	--	--
Arsenic	7440-38-2	9.5	J	0.0095	1.1E-08	7.8E-07	1.5E+00	3.0E-04	1.7E-08	100%	0.0026	3.2%
Barium	7440-39-3	751		0.75	--	6.2E-05	--	2.0E-01	--	--	0.00031	0.38%
Beryllium	7440-41-7	5		0.0050	--	4.1E-07	--	2.0E-03	--	--	0.00021	0.25%
Cadmium	7440-43-9	4	U	NC	--	NC	--	5.0E-04	--	--	--	--
Cobalt	7440-48-4	94.4		0.094	--	7.8E-06	--	3.0E-04	--	--	0.026	32%
Copper	7440-50-8	123		0.12	--	1.0E-05	--	4.0E-02	--	--	0.00025	0.31%
Manganese	7439-96-5	4640		4.6	--	3.8E-04	--	2.4E-02	--	--	0.016	20%
Mercury	7487-94-7	0.29		0.00029	--	2.4E-08	--	3.0E-04	--	--	0.000079	0.10%
Nickel	7440-02-0	209		0.21	--	1.7E-05	--	2.0E-02	--	--	0.00086	1.1%
Thallium	7440-28-0	3.4	J	0.0034	--	2.8E-07	--	1.0E-05	--	--	0.028	35%
Vanadium	7440-62-2	93.1		0.093	--	7.7E-06	--	5.0E-03	--	--	0.0015	1.9%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	2E-08	100%	0.1	100%
Chromium [10]												
Chromium (III)	16065-83-1	106		0.11	--	8.7E-06	--	1.5E+00	--	--	0.0000058	0.0072% [11]
Chromium (VI)	18540-29-9	106		0.11	1.2E-07	8.7E-06	5.0E-01	3.0E-03	6.2E-08	79% [12]	0.0029	3.5% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-08	--	0.1	--
								Pathway Sums (including Chromium (VI)):	8E-08	--	0.1	--

Table B.4.67

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.68

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	63300	0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	1.3E-04	--	4.51E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00045	0.96%
Antimony	7440-36-0	21.6 UJ	NC	0.0010	1.2	N/A	1.0	0.51	0.0042	NC	NC	NC	0.15	--	4.0E-04	--	6.0E-05	--	--	--	--
Arsenic	7440-38-2	9.5 J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	1.9E-08	9.7E-10	6.77E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.5E-09	100%	0.00023	0.48%
Barium	7440-39-3	751	0.00075	0.0010	1.5	N/A	1.0	0.62	0.0045	1.5E-06	--	5.35E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00038	0.81%
Beryllium	7440-41-7	5	0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	1.0E-08	--	3.57E-08	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0025	5.4%
Cadmium	7440-43-9	4 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	94.4	0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	7.6E-08	--	2.69E-07	1	--	3.0E-04	--	3.0E-04	--	--	0.00090	1.9%
Copper	7440-50-8	123	0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	2.5E-07	--	8.77E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.000022	0.047%
Manganese	7439-96-5	4640	0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	9.3E-06	--	3.31E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.034	73%
Mercury	7487-94-7	0.29	0.00000029	0.0010	8.4	N/A	1.0	3.49	0.0063	5.8E-10	--	2.07E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00010	0.21%
Nickel	7440-02-0	209	0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	8.4E-08	--	2.98E-07	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00037	0.79%
Thallium	7440-28-0	3.4 J	0.0000034	0.0010	3.5	N/A	1.0	1.47	0.0055	6.8E-09	--	2.42E-08	1	--	1.0E-05	--	1.0E-05	--	--	0.0024	5.2%
Vanadium	7440-62-2	93.1	0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	1.9E-07	--	6.64E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0051	11%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	1E-09	100%	0.05	100%
Chromium (19)																					
Chromium (III)	16065-83-1	106	0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	2.1E-07	--	7.56E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000039	0.082% (20)
Chromium (VI)	18540-29-9	106	0.00011	0.0020	0.4934691	N/A	1.0	0.21	0.0055	4.2E-07	2.2E-08	0.0000015	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	4.3E-07	100% (21)	0.020	30% (22)
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	1E-09	--	0.05	--
																	Pathway Sums (including Chromium (VI)):	4E-07	--	0.07	--

Table B.4.68

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.69

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Groundwater Ingestion Rate, (IRW)	2.5	L/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, (ED)	25	yrs
Averaging Time, Carcinogens (AT_c)	70	yrs
Averaging Time, Noncarcinogens (AT_{nc})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(ED)(IRW)(EF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds												
Bis(2-Ethylhexyl)phthalate	117-81-7	11	U	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--
Metals												
Aluminum	7429-90-5	63300		63	--	1.2E+00	--	1.0E+00	--	--	1.2	6.4%
Antimony	7440-36-0	21.6	UJ	NC	NC	NC	--	4.0E-04	--	--	--	--
Arsenic	7440-38-2	9.5	J	0.0095	6.5E-05	1.8E-04	1.5E+00	3.0E-04	9.8E-05	100%	0.61	3.2%
Barium	7440-39-3	751		0.75	--	1.4E-02	--	2.0E-01	--	--	0.072	0.38%
Beryllium	7440-41-7	5		0.0050	--	9.6E-05	--	2.0E-03	--	--	0.048	0.25%
Cadmium	7440-43-9	4	U	NC	NC	NC		5.0E-04	--	--	--	--
Cobalt	7440-48-4	94.4		0.094	--	1.8E-03	--	3.0E-04	--	--	6.1	32%
Copper	7440-50-8	123		0.12	--	2.4E-03	--	4.0E-02	--	--	0.059	0.31%
Manganese	7439-96-5	4640		4.6	--	8.9E-02	--	2.4E-02	--	--	3.7	20%
Mercury	7487-94-7	0.29		0.00029	--	5.6E-06	--	3.0E-04	--	--	0.019	0.10%
Nickel	7440-02-0	209		0.21	--	4.0E-03	--	2.0E-02	--	--	0.20	1.1%
Thallium	7440-28-0	3.4	J	0.0034	--	6.5E-05	--	1.0E-05	--	--	6.5	35%
Vanadium	7440-62-2	93.1		0.093	--	1.8E-03	--	5.0E-03	--	--	0.36	1.9%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	1E-04	100%	19	100%
Chromium [10]												
Chromium (III)	16065-83-1	106		0.11	--	2.0E-03	--	1.5E+00	--	--	0.0014	0.0072% [11]
Chromium (VI)	18540-29-9	106		0.11	7.3E-04	2.0E-03	5.0E-01	3.0E-03	3.6E-04	79% [12]	0.68	3.5% [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	1E-04	--	19	--
								Pathway Sums (including Chromium (VI)):	5E-04	--	20	--

Table B.4.69

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.70
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Event Duration (t_{event})	1.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1.0	events/day
Exposure Duration, adult (ED_a)	25	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds																					
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	1.1300	73	Yes	0.8	16	8.6	-- (18)	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--
Metals																					
Aluminum	7429-90-5	63300	0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	6.3E-05	--	1.7E-03	1	--	1.0E+00	--	1.0E+00	--	--	0.0017	0.96%
Antimony	7440-36-0	21.6 UJ	NC	0.0010	1.21	N/A	1.0	0.51	0.0042	NC	--	NC	0.15	--	4.0E-04	--	6.0E-05	--	--	--	--
Arsenic	7440-38-2	9.5 J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	9.5E-09	9.1E-08	2.5E-07	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	1.4E-07	100%	0.00085	0.48%
Barium	7440-39-3	751	0.00075	0.0010	1.48	N/A	1.0	0.62	0.0045	7.5E-07	--	2.0E-05	0.07	--	2.0E-01	--	1.4E-02	--	--	0.0014	0.81%
Beryllium	7440-41-7	5	0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	5.0E-09	--	1.3E-07	0.007	--	2.0E-03	--	1.4E-05	--	--	0.0095	5.4%
Cadmium	7440-43-9	4 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	--	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--
Cobalt	7440-48-4	94.4	0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	3.8E-08	--	1.0E-06	1	--	3.0E-04	--	3.0E-04	--	--	0.0034	1.9%
Copper	7440-50-8	123	0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	1.2E-07	--	3.3E-06	1	--	4.0E-02	--	4.0E-02	--	--	0.000082	0.047%
Manganese	7439-96-5	4640	0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	4.6E-06	--	1.2E-04	0.04	--	2.4E-02	--	9.6E-04	--	--	0.13	73%
Mercury	7487-94-7	0.29	0.00000029	0.0010	8.36	N/A	1.0	3.49	0.0063	2.9E-10	--	7.8E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00037	0.21%
Nickel	7440-02-0	209	0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	4.2E-08	--	1.1E-06	0.04	--	2.0E-02	--	8.0E-04	--	--	0.0014	0.79%
Thallium	7440-28-0	3.4 J	0.0000034	0.0010	3.52	N/A	1.0	1.47	0.0055	3.4E-09	--	9.1E-08	1	--	1.0E-05	--	1.0E-05	--	--	0.0091	5.2%
Vanadium	7440-62-2	93.1	0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	9.3E-08	--	2.5E-06	0.026	--	5.0E-03	--	1.3E-04	--	--	0.019	11%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	1E-07	100%	0.18	100%
Chromium (19)																					
Chromium (III)	16065-83-1	106	0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	1.1E-07	--	2.8E-06	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00015	0.034% (20)
Chromium (VI)	18540-29-9	106	0.00011	0.0020	0.49	N/A	1.0	0.21	0.0055	2.1E-07	2.0E-06	5.7E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	4.0E-05	100% (21)	0.076	18% (22)
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	1E-07	--	0.43	--
																	Pathway Sums (including Chromium (VI)):	4E-05	--	0.42	--

Table B.4.70
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.
(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(20) Percent increase in cumulative hazard due to chromium (III).
(21) Percent increase in cumulative risk due to chromium (VI).
(22) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.71

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Groundwater (C_W)	chemical-specific	mg/L
Age-adjusted Groundwater Ingestion Rate (IFW_{adj})	0.94	L-yr/kg-day
Groundwater Ingestion Rate, child (IRW_c)	0.78	L/day
Groundwater Ingestion Rate, adult (IRW_a)	2.5	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (μg/L) (4)	Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds														
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	NC	NC	NC	NC	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	63300	63	--	2.2E-01	1.3E-01	--	1.0E+00	--	--	0.22	6.4%	0.13	6.4%
Antimony	7440-36-0	21.6 UJ	NC	NC	NC	NC	--	4.0E-04	--	--	--	--	--	--
Arsenic	7440-38-2	9.5 J	0.0095	8.4E-06	3.2E-05	2.0E-05	1.5E+00	3.0E-04	1.3E-05	100%	0.11	3.2%	0.065	3.2%
Barium	7440-39-3	751	0.75	--	2.6E-03	1.5E-03	--	2.0E-01	--	--	0.013	0.38%	0.0077	0.38%
Beryllium	7440-41-7	5	0.0050	--	1.7E-05	1.0E-05	--	2.0E-03	--	--	0.0085	0.25%	0.0051	0.25%
Cadmium	7440-43-9	4 U	NC	NC	NC	NC	--	5.0E-04	--	--	--	--	--	--
Cobalt	7440-48-4	94.4	0.094	--	3.2E-04	1.9E-04	--	3.0E-04	--	--	1.1	32%	0.65	32%
Copper	7440-50-8	123	0.12	--	4.2E-04	2.5E-04	--	4.0E-02	--	--	0.011	0.31%	0.0063	0.31%
Manganese	7439-96-5	4640	4.6	--	1.6E-02	9.5E-03	--	2.4E-02	--	--	0.66	20%	0.40	20%
Mercury	7487-94-7	0.29	0.00029	--	9.9E-07	6.0E-07	--	3.0E-04	--	--	0.0033	0.10%	0.0020	0.10%
Nickel	7440-02-0	209	0.21	--	7.1E-04	4.3E-04	--	2.0E-02	--	--	0.036	1.1%	0.021	1.1%
Thallium	7440-28-0	3.4 J	0.0034	--	1.2E-05	7.0E-06	--	1.0E-05	--	--	1.2	35%	0.70	35%
Vanadium	7440-62-2	93.1	0.093	--	3.2E-04	1.9E-04	--	5.0E-03	--	--	0.064	1.9%	0.038	1.9%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	1E-05	100%	3	100%	2	100%
Chromium (10)														
Chromium (III)	16065-83-1	106	0.11	--	3.6E-04	2.2E-04	--	1.5E+00	--	--	0.00024	0.0072% (11)	0.00015	0.0072% (11)
Chromium (VI)	18540-29-9	106	0.11	9.3E-05	3.6E-04	2.2E-04	5.0E-01	3.0E-03	4.7E-05	79% (12)	0.12	3.5% (13)	0.073	3.5% (13)
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	1E-05	--	3	--	2	--
								Pathway Sums:	6E-05	--	3	--	2	--

Table B.4.71

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF GROUNDWATER AS DRINKING WATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

Table B.4.72
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER
Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	22,692	events-cm^2/kg
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	0.54	hours/event
Event Duration (t_{event}) - adult	0.71	hours/event
Event Duration (t_{event}) [(t_{event} - child)+(t_{event} - adult)]	0.67	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	970	cm^2
Exposed Skin Surface Area, adult (SA_a)	2230	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] (mg/kg-day)$^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] (mg/kg-day)$^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																								
Bis(2-Ethylhexyl)phthalate	117-81-7	11 U	--	1.1300	73	Yes	0.8	16	8.6	-- [18]	--	--	--	1	1.4E-02	2.0E-02	1.4E-02	2.0E-02	--	--	--	--	--	--
Metals																								
Aluminum	7429-90-5	63300	0.063	0.0010	0.36	N/A	1.0	0.15	0.0020	4.2E-05	--	1.8E-04	7.8E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.00018	0.96%	0.000078	0.96%
Antimony	7440-36-0	21.6 UJ	NC	0.0010	1.21	N/A	1.0	0.51	0.0042	NC	NC	NC	NC	0.15	--	4.0E-04	--	6.0E-05	--	--	--	--	--	--
Arsenic	7440-38-2	9.5 J	0.0000095	0.0010	0.66	N/A	1.0	0.28	0.0033	6.4E-09	5.7E-09	2.7E-08	1.2E-08	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	8.5E-09	100%	0.000090	0.48%	0.000039	0.48%
Barium	7440-39-3	751	0.00075	0.0010	1.48	N/A	1.0	0.62	0.0045	5.0E-07	--	2.1E-06	9.2E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00015	0.81%	0.000066	0.81%
Beryllium	7440-41-7	5	0.0000050	0.0010	0.28	N/A	1.0	0.12	0.0012	3.4E-09	--	1.4E-08	6.1E-09	0.007	--	2.0E-03	--	1.4E-05	--	--	0.00102	5.4%	0.00044	5.4%
Cadmium	7440-43-9	4 U	NC	0.0010	1.08	N/A	1.0	0.45	0.0041	NC	NC	NC	NC	0.05	--	5.0E-04	--	2.5E-05	--	--	--	--	--	--
Cobalt	7440-48-4	94.4	0.000094	0.0004	0.54	N/A	1.0	0.22	0.0012	2.5E-08	--	1.1E-07	4.6E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.00036	1.9%	0.00015	1.9%
Copper	7440-50-8	123	0.00012	0.0010	0.57	N/A	1.0	0.24	0.0031	8.3E-08	--	3.5E-07	1.5E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.0000088	0.047%	0.0000038	0.047%
Manganese	7439-96-5	4640	0.0046	0.0010	0.51	N/A	1.0	0.21	0.0029	3.1E-06	--	1.3E-05	5.7E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.014	73%	0.0059	73%
Mercury	7487-94-7	0.29	0.00000029	0.0010	8.36	N/A	1.0	3.49	0.0063	1.9E-10	--	8.3E-10	3.6E-10	0.07	--	3.0E-04	--	2.1E-05	--	--	0.000039	0.21%	0.000017	0.21%
Nickel	7440-02-0	209	0.00021	0.0002	0.54	N/A	1.0	0.22	0.0006	2.8E-08	--	1.2E-07	5.1E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00015	0.79%	0.000064	0.79%
Thallium	7440-28-0	3.4 J	0.0000034	0.0010	3.52	N/A	1.0	1.47	0.0055	2.3E-09	--	9.7E-09	4.2E-09	1	--	1.0E-05	--	1.0E-05	--	--	0.0010	5.2%	0.00042	5.2%
Vanadium	7440-62-2	93.1	0.000093	0.0010	0.49	N/A	1.0	0.20	0.0027	6.2E-08	--	2.7E-07	1.1E-07	0.026	--	5.0E-03	--	1.3E-04	--	--	0.0020	11%	0.00088	11%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	8E-09	100%	0.02	100%	0.01	100%
Chromium [19]																								
Chromium (III)	16065-83-1	106	0.00011	0.0010	0.49	N/A	1.0	0.21	0.0028	7.1E-08	--	3.0E-07	1.3E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000016	0.082% [20]	0.00001	0.082% [20]
Chromium (VI)	18540-29-9	106	0.00011	0.0020	0.49	N/A	1.0	0.21	0.0055	1.4E-07	1.3E-07	6.0E-07	2.6E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	2.5E-06	100% [21]	0.0081	30% [22]	0.003	30% [22]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	8E-09	--	0.02	--	0.01	--
																		Pathway Sums (including Chromium (VI)):	3E-06	--	0.03	--	0.01	--

Table B.4.72

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH GROUNDWATER

Maximum Detected Concentration from 2010 through 2013 for Individual Wells within Exposure Area- MW 45-4

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration for individual wells. See Table 2.12.

(4) μg/L = microgram per liter.

(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).

(7) cm/hour = centimeter/hour.

(8) Values obtained from USEPA Regional

(9) mg/cm^2-event = milligram per squared centimeter per event.

(10) DAD = Dermally absorbed dose.

(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E,

(17) RfD_d is the dermal reference dose, derived

(18) The permeability coefficient of bis(2-Ethylhexyl)phthalate falls outside the effective prediction domain (USPEA 2004), and thus, dermal contact with water should not be evaluated for this analyte.

(19) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(20) Percent increase in cumulative hazard due to chromium (III).

(21) Percent increase in cumulative risk due to chromium (VI).

(22) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A = Not applicable.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

NC= Analyte not calculated because no detected concentrations were present in the well.

B.5 Surface Soil Risk Characterization Calculations for Kickout Area

B.5.1 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates - Incidental Ingestion of Surface Soil (0-≤2')

B.5.2 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates - Dermal Contact with Surface Soil (0-≤2')

B.5.3 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates - Inhalation of Volatiles/Fugitive Dust from Surface Soil (0-≤2')

B.5.4 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Incidental Ingestion of Surface Soil (0-≤2')

B.5.5 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Dermal Contact with Surface Soil (0-≤2')

B.5.6 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Inhalation of Volatiles/Fugitive Dust from Surface Soil (0-≤2')

B.5.7 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Incidental Ingestion of Surface Soil (0-≤2')

B.5.8 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Dermal Contact with Surface Soil (0-≤2')

B.5.9 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates - Inhalation of Volatiles/Fugitive Dust from Surface Soil (0-≤2')

B.5.10 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates - Incidental Ingestion of Surface Soil (0-≤2')

B.5.11 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates - Dermal Contact with Surface Soil (0-≤2')

B.5.12 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates - Inhalation of Volatiles/Fugitive Dust from Surface Soil (0-≤2')

Table B.5.1

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Incidental Soil Ingestion Rate, child (IRS_c)	200	mg/day
Age-adjusted soil ingestion factor (IFS_{adj})	105	(mg-year)/(kg-day)
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic analytes the intake is calculated as:

$$Intake = \frac{(C_s)(IFS_{adj})(EF)(CF)}{(AT)(365\ day/year)}$$

where: $$IFS_{adj} = \frac{(ED_c)(IRS_c)}{(BW_c)} + \frac{(ED_a)(IRS_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$Intake_{child} = \frac{(C_s)(IRS_c)(EF)(ED_c)(CF)}{(BW_c)(AT_{child})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration [3] (mg/kg) [4]	Carcinogenic Intake (mg/kg-day) [5]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SFo [6] $(mg/kg\text{-}day)^{-1}$ [7]	RfDo [8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds													
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--
Herbicides													
MCPA	94-74-6	9.4	--	1.2E-04	1.1E-05	--	5.0E-04	--	--	0.24	8%	0.023	8%
Metals													
Aluminum	7429-90-5	18000	--	2.3E-01	2.2E-02	--	1.0E+00	--	--	0.23	8%	0.022	8%
Arsenic	7440-38-2	6.3	9.1E-06	8.1E-05	7.6E-06	1.5E+00	3.0E-04	1.4E-05	100%	0.27	9%	0.025	9%
Cadmium	7440-43-9	2.6	--	3.3E-05	3.1E-06	--	1.0E-03	--	--	0.033	1.2%	0.0031	1.2%
Cobalt	7440-48-4	44	--	5.6E-04	5.3E-05	--	3.0E-04	--	--	1.88	65%	0.176	65%
Manganese	7439-96-5	1700	--	2.2E-02	2.0E-03	--	1.4E-01	--	--	0.16	5%	0.015	5%
Vanadium	7440-62-2	33	--	4.2E-04	3.9E-05	--	5.0E-03	--	--	0.084	3%	0.008	3%
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums:	1.4E-05	100%	2.9	100%	0.27	100%
Chromium [9]													
Chromium (III)	16065-83-1	29	--	3.6E-04	3.4E-05	--	1.5E+00	--	--	0.00024	0.0084% [10]	0.000023	0.0084% [10]
Chromium (VI)	18540-29-9	29	4.1E-05	3.6E-04	3.4E-05	5.0E-01	3.0E-03	2.0E-05	60% [11]	0.12	4% [12]	0.011	4% [12]
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	1.4E-05	--	2.9	--	0.3	--
							Pathway Sums (including Chromium (VI)):	3.4E-05	--	3.0	--	0.3	--

Table B.5.1
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.
(4) mg/kg = milligram per kilogram
(5) mg/kg-day = milligram per kilogram-day.
(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(10) Percent increase in cumulative hazard due to chromium (III).
(11) Percent increase in cumulative risk due to chromium (VI).
(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.5.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

Exposure Assumptions

Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	350	days/yr
Exposure Duration, adult (Ed_a)	20	yrs
Exposure Duration, child (Ed_c)	6	yrs
Event Frequency (EV)	1	event/day
Skin Surface Area, adult (SA_a)	6032	cm^2
Skin Surface Area, child (SA_c)	2690	cm^2
Age-adjusted dermal contact factor (SFS_{adj})	320.76	(mg-year)/(kg-day)
Dermal Adherence Factor, adult (AF_a)	0.07	mg/cm^2-day
Dermal Adherence Factor, child (AF_c)	0.2	mg/cm^2-day
Dermal Absorption Factor (ABS)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(C_s)(SFS_{adj})(ABS)(EF)(EV)(CF)}{(AT)(365\,days/year)}$$

where: $$SFS_{adj} = \frac{(ED_c)(AF_c)(SA_c)}{(BW_c)} + \frac{(ED_a)(AF_a)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(C_s)(ED_c)(AF_c)(SA_c)(ABS)(EF)(EV)(CF)}{(BW_c)(AT_{child})(365\,days/year)}$$

$$DAD_{adult} = \frac{(C_s)(ED_a)(AF_a)(SA_a)(ABS)(EF)(EV)(CF)}{(BW_a)(AT_{adult})(365\,days/year)}$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (mg/kg) [4]	ABS [5] (unitless)	GIABS [6] (unitless)	SFo [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfDo [9] (mg/kg-day) [10]	SF_d [11] $(mg/kg\text{-}day)^{-1}$	RfD_d [12] (mg/kg-day)	Carcinogenic DAD [13] (mg/kg-day)	Noncarcinogenic DAD - Child (mg/kg-day)	Noncarcinogenic DAD - Adult (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																	
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides																	
MCPA	94-74-6	9.4	0.1	1	--	5.0E-04	--	5.0E-04	--	3.2E-05	4.8E-06	--	--	0.065	72%	0.010	72%
Metals																	
Aluminum	7429-90-5	18000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	8.3E-07	6.5E-06	9.6E-07	5.5E-07	100%	0.022	24%	0.0032	24%
Cadmium	7440-43-9	2.6	0.001	0.025	--	1.0E-03	--	2.5E-05	--	9.0E-08	1.3E-08	--	--	0.0036	4%	0.00053	4%
Cobalt	7440-48-4	44.0	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	1700	--	0.04	--	1.4E-01	--	5.6E-03	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	33	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums:	5.5E-07		0.090		0.013	
Chromium [14]																	
Chromium (III)	16065-83-1	29	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--	--	--
Chromium (VI) [14]	18540-29-9	29	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	5.5E-07		0.090		0.013	
											Pathway Sums (including Chromium (VI)):	5.5E-07		0.090		0.013	

Table B.5.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

(4) mg/kg = milligram per kilogram

(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).

(6) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) mg/kg-day = milligram per kilogram-day.

(11) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(12) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(13) DAD = Dermally absorbed dose.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

Table B.5.3
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC in air (C_a)	chemical-specific	$\mu g/m^3$
COPC in surface soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	350	days/yr
Exposure Duration (ED)	26	yrs
Fraction of EF breathing air at site (ET)	1	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	26	yrs
Inhalation Unit Risk (IUR)	chemical-specific	$(\mu g/m^3)^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000\mu g/mg)(\frac{1}{VF} + \frac{1}{PEF})$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000\mu g/mg)(\frac{1}{PEF}) + (C_{sat})(1000\mu g/mg)(\frac{1}{VF})$$

where, for inorganics: $$C_a = (C_s)(1000\ \mu g/mg)(\frac{1}{PEF})$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration[3] (mg/kg)[4]	C_{sat}[5] (mg/kg)	Is EPC ≤ C_{sat}[6]?	Volatilization Factor[7] (m^3/kg)[8]	C_a ($\mu g/m^3$)[9]	Carcinogenic EC(air) ($\mu g/m^3$)	Noncarcinogenic EC(air) ($\mu g/m^3$)	IUR[10] ($(\mu g/m^3)^{-1}$)[11]	RfC[12] (mg/m^3)[13]	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides														
MCPA	94-74-6	9.4	1.1E+02	Yes	4.3E+05	2.2E-02	--	--	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	18000	N/A	N/A	N/A	1.4E-02	--	1.3E-02	--	5.0E-03	--	--	0.0026	7.8%
Arsenic	7440-38-2	6.3	N/A	N/A	N/A	4.8E-06	1.7E-06	4.6E-06	4.3E-03	1.5E-05	7.3E-09	6%	0.00031	0.91%
Cadmium	7440-43-9	2.6	N/A	N/A	N/A	2.0E-06	7.1E-07	1.9E-06	1.8E-03	1.0E-05	1.3E-09	1%	0.00019	0.57%
Cobalt	7440-48-4	44.0	N/A	N/A	N/A	3.3E-05	1.2E-05	3.2E-05	9.0E-03	6.0E-06	1.1E-07	93%	0.0053	16%
Manganese	7439-96-5	1700	N/A	N/A	N/A	1.3E-03	--	1.2E-03	--	5.0E-05	--	--	0.025	74%
Vanadium	7440-62-2	33	N/A	N/A	N/A	2.5E-05	--	2.4E-05	--	1.0E-04	--	--	0.0002	0.71%
											Cancer Risk		**Hazard Index**	
										Pathway Sums:	1E-07	100%	0.033	100%
Chromium[14]														
Chromium (III)	16065-83-1	29	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Chromium (VI)[14]	18540-29-9	29	N/A	N/A	N/A	2.2E-05	7.7E-06	2.1E-05	8.4E-02	1.0E-04	6.5E-07	85%[15]	0.0002	0.32%[16]
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	1E-07	--	0.065	--
										Pathway Sums (including Chromium (VI)):	8E-07	--	0.064	--

Table B.5.3
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.
(4) mg/kg = milligram per kilogram
(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.
(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) μg/m^3 = micrograms per cubic meter.
(10) IUR is the inhalation unit risk. IUR values
(11) (μg/m^3)$^{-1}$ = inverse of micrograms per cubic meter.
(12) RfC is the reference concentration. RfC
(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

Table B.5.4

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration, adult (ED_a)	1	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC(1)	CAS Number(2)	Exposure Point Concentration (3) (mg/kg) (4)	Carcinogenic Intake (mg/kg-day) (5)	Noncarcinogenic Intake (mg/kg-day)	SFo (6) $(mg/kg\text{-}day)^{-1}$ (7)	RfDo (8) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds										
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--
Herbicides										
MCPA	94-74-6	9.4	--	9.7E-07	--	5.0E-04	--	--	0.0019	8%
Metals										
Aluminum	7429-90-5	18000	--	1.8E-03	--	1.0E+00	--	--	0.0018	8%
Arsenic	7440-38-2	6.3	9.2E-09	6.5E-07	1.5E+00	3.0E-04	1.4E-08	100%	0.0022	9%
Cadmium	7440-43-9	2.6	--	2.7E-07	--	1.0E-03	--	--	0.00027	1.2%
Cobalt	7440-48-4	44		4.5E-06	--	3.0E-04	--	--	0.015	65%
Manganese	7439-96-5	1700	--	1.7E-04	--	1.4E-01	--	--	0.0012	5%
Vanadium	7440-62-2	33	--	3.4E-06	--	5.0E-03	--	--	0.00067	3%
							Cancer Risk		**Hazard Index**	
						Pathway Sums	1.4E-08	100%	0.023	100%
Chromium (9)										
Chromium (III)	16065-83-1	29	--	2.9E-06	--	1.5E+00	--	--	0.0000020	0.0084% (10)
Chromium (VI)	18540-29-9	29	4.2E-08	2.9E-06	5.0E-01	3.0E-03	2.1E-08	60% (11)	0.0010	4% (12)
							Cancer Risk		**Hazard Index**	
						Pathway Sums (including Chromium(III)):	1.4E-08		0.023	
						Pathway Sums (including Chromium (VI)):	3.5E-08		0.024	

Table B.5.4
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-2')
Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.
(4) mg/kg = milligram per kilogram
(5) mg/kg-day = milligram per kilogram-day.
(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(10) Percent increase in cumulative hazard due to chromium (III).
(11) Percent increase in cumulative risk due to chromium (VI).
(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.5.5

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Event Frequency (EV)	1	events/ day
Skin Surface Area (SA_a)	3470	cm^2
Dermal Adherence Factor (AF_d)	0.12	mg/cm^2-day
Dermal Absorption Factor (ABS_d)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EF)(ED_a)(EV)(SA_a)}{(BW_a)(AT)(365 days / year)}$$

where: $$DA_{event} = (C_s)(AF_a)(ABS)(CF)$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (mg/kg) [4]	ABS [5] (unitless)	GIABS [6] (unitless)	SFo [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfDo [9] (mg/kg-day)	SF_d [10] $(mg/kg\text{-}day)^{-1}$	RfD_d [11] (mg/kg-day)	DA_{event} (mg/cm^2-event) [12]	Carcinogenic DAD [13] (mg/kg-day) [14]	Noncarcinogenic DAD (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds															
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides															
MCPA	94-74-6	9.4	0.1	1	--	5.0E-04	--	5.0E-04	1.1E-07	5.7E-09	4.0E-07	--	--	0.00080	72%
Metals															
Aluminum	7429-90-5	18000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.3E-08	1.2E-09	8.1E-08	1.73E-09	100%	0.00027	24%
Cadmium	7440-43-9	2.6	0.001	0.025	--	1.0E-03	--	2.5E-05	3.1E-10	--	1.1E-09	--	--	0.000045	4.0%
Cobalt	7440-48-4	44.0	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--
Manganese	7439-96-5	1700	--	0.04	--	1.4E-01	--	5.6E-03	--	--	--	--	--	--	--
Vanadium	7440-62-2	33	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums:	1.7E-09	100%	0.0011	100%
Chromium [15]															
Chromium (III)	16065-83-1	29	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	29	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	1.7E-09	--	0.0011	--
											Pathway Sums (including Chromium (VI)):	1.7E-09	--	0.0011	--

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.9.

(4) mg/kg = milligram per kilogram

(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).

(6) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(11) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(12) mg/cm^2-event = milligram per squared centimeter per event.

(13) DAD = Dermally absorbed dose.

(14) mg/kg-day = milligram per kilogram-day.

(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.

Table B.5.6

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC in soil (C_s)	chemical-specific	mg/kg
COPC in air (C_a)	chemical-specific	µg/m^3
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Fraction of EF breathing air at site (ET)	0.333	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Inhalation Unit Risk (IUR)	chemical-specific	(µg/m^3)$^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000\mu g/mg)\left(\frac{1}{VF} + \frac{1}{PEF}\right)$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000\mu g/mg)\left(\frac{1}{PEF}\right) + (C_{sat})(1000\mu g/mg)\left(\frac{1}{VF}\right)$$

where, for inorganics: $$C_a = (C_s)(1{,}000\mu g/mg)\left(\frac{1}{PEF}\right)$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration [3] (mg/kg) [4]	C_{sat} [5] (mg/kg)	Is EPC ≤ C_{sat}[6]?	Volatilization Factor [7] (m^3/kg) [8]	C_a (µg/m^3) [9]	Carcinogenic EC(air) (µg/m^3)	Noncarcinogenic EC(air) (µg/m^3)	IUR [10] (µg/m^3)$^{-1}$ [11]	RfC [12] (mg/m^3) [13]	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides														
MCPA	94-74-6	9.4	1.1E+02	Yes	4.3E+05	2.2E-02	--	--	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	18000	N/A	N/A	N/A	1.4E-02		3.7E-04	--	5.0E-03	--	--	0.00007	7.8%
Arsenic	7440-38-2	6.3	N/A	N/A	N/A	4.8E-06	1.9E-09	1.3E-07	4.3E-03	1.5E-05	8.0E-12	6%	0.000009	0.91%
Cadmium	7440-43-9	2.6	N/A	N/A	N/A	2.0E-06	7.8E-10	5.4E-08	1.8E-03	1.0E-05	1.4E-12	1%	0.000005	0.57%
Cobalt	7440-48-4	44.0	N/A	N/A	N/A	3.3E-05	1.3E-08	9.1E-07	9.0E-03	6.0E-06	1.2E-10	93%	0.000152	16%
Manganese	7439-96-5	1700	N/A	N/A	N/A	1.3E-03		3.5E-05	--	5.0E-05	--	--	0.0007	74%
Vanadium	7440-62-2	33	N/A	N/A	N/A	2.5E-05		6.8E-07	--	1.0E-04	--	--	0.000007	0.71%
											Cancer Risk		**Hazard Index**	
										Pathway Sums:	1E-10	100%	0.0010	100%
Chromium [14]														
Chromium (III)	16065-83-1	29	N/A	N/A	N/A	2.2E-05	8.5E-09	--	--	--	--	--	--	--
Chromium (VI) [14]	18540-29-9	29	N/A	N/A	N/A	2.2E-05	8.5E-09	5.9E-07	8.4E-02	1.0E-04	7.1E-10	85% [15]	0.0000059	0.62% [16]
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	1E-10	--	0.0010	--
										Pathway Sums (including Chromium (VI)):	8E-10	--	0.0010	--

Table B.5.6

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

(4) mg/kg = milligram per kilogram

(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.

(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) μg/m^3 = micrograms per cubic meter.

(10) IUR is the inhalation unit risk. IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(11) (μg/m^3)$^{-1}$ = inverse of micrograms per cubic meter.

(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

Table B.5.7

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Exposure Frequency (EF)	225	days/yr
Exposure Duration, adult (ED_a)	25	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT)(365\ day\ /\ year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC[1]	CAS Number[2]	Exposure Point Concentration[3] (mg/kg)[4]	Carcinogenic Intake (mg/kg-day)[5]	Noncarcinogenic Intake (mg/kg-day)	SFo[6] (mg/kg-day)$^{-1}$ [7]	RfDo[8] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds										
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--
Herbicides										
MCPA	94-74-6	9.4	--	7.2E-06	--	5.0E-04	--	--	0.014	8%
Metals										
Aluminum	7429-90-5	18000	--	1.4E-02	--	1.0E+00	--	--	0.014	8%
Arsenic	7440-38-2	6.3	1.7E-06	4.9E-06	1.5E+00	3.0E-04	2.6E-06	100%	0.016	9.3%
Cadmium	7440-43-9	2.6	--	2.0E-06	--	1.0E-03	--	--	0.0020	1.2%
Cobalt	7440-48-4	44		3.4E-05	--	3.0E-04			0.11	65%
Manganese	7439-96-5	1700	--	1.3E-03	--	1.4E-01	--	--	0.0094	5%
Vanadium	7440-62-2	33	--	2.5E-05	--	5.0E-03	--	--	0.0050	3%
							Cancer Risk		**Hazard Index**	
						Pathway Sums	2.6E-06	100%	0.17	100%
Chromium[9]										
Chromium (III)	16065-83-1	29	--	2.2E-05	--	1.5E+00	--	--	0.000015	0.0084% [10]
Chromium (VI)	18540-29-9	29	7.8E-06	2.2E-05	5.0E-01	3.0E-03	3.9E-06	60% [11]	0.01	4.0% [12]
							Cancer Risk		**Hazard Index**	
						Pathway Sums (including Chromium(III)):	2.6E-06	--	0.17	--
						Pathway Sums (including Chromium (VI)):	6.5E-06	--	0.18	--

[1] COPC = Constituent of potential concern.

[2] CAS = Chemical Abstracts Service number.

[3] Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

[4] mg/kg = milligram per kilogram

[5] mg/kg-day = milligram per kilogram-day.

[6] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

[7] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

[8] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014

[9] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

[10] Percent increase in cumulative hazard due to chromium (III).

[11] Percent increase in cumulative risk due to chromium (VI).

[12] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.5.8
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	225	days/yr
Exposure Duration (ED)	25	yrs
Event Frequency (EV)	1	events/ day
Skin Surface Area (SA_a)	3470	cm^2
Dermal Adherence Factor (AF_d)	0.12	mg/cm^2-day
Dermal Absorption Factor (ABS_d)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (Sfo / GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d) (RfDo x GIABS)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EF)(ED_a)(EV)(SA_a)}{(BW_a)(AT)(365 days / year)}$$

where: $$DA_{event} = (C_s)(AF_a)(ABS)(CF)$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (mg/kg) [4]	ABS [5] (unitless)	GIABS [6] (unitless)	SFo [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfDo [9] (mg/kg-day)	SF_d [10] $(mg/kg\text{-}day)^{-1}$	RfD_d [11] (mg/kg-day)	DA_{event} (mg/cm^2-event) [12]	Carcinogenic DAD [13] (mg/kg-day) [14]	Noncarcinogenic DAD (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds															
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--	
Herbicides															
MCPA	94-74-6	9.4	0.1	1	--	5.0E-04	--	5.0E-04	1.1E-07	1.1E-06	3.0E-06	--	--	0.0060	72%
Metals															
Aluminum	7429-90-5	18000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	2.3E-08	2.2E-07	6.1E-07	3.2E-07	100%	0.0020	24%
Cadmium	7440-43-9	2.6	0.001	0.025	--	1.0E-03	--	2.5E-05	3.1E-10	--	8.4E-09	--	--	0.00034	4.0%
Cobalt	7440-48-4	44.0	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--
Manganese	7439-96-5	1700	--	0.04	--	1.4E-01	--	5.6E-03	--	--	--	--	--	--	--
Vanadium	7440-62-2	33	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums:	3.2E-07	100%	0.0084	100%
Chromium [15]															
Chromium (III)	16065-83-1	29	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	29	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	3.2E-07	--	0.0084	--
											Pathway Sums (including Chromium (VI)):	3.2E-07	--	0.0084	--

Table B.5.8
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.
(4) mg/kg = milligram per kilogram
(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).
(6) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(9) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(11) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(12) mg/cm^2-event = milligram per squared centimeter per event.
(13) DAD = Dermally absorbed dose.
(14) mg/kg-day = milligram per kilogram-day.
(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.

Table B.5.9

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC in soil (C_s)	chemical-specific	mg/kg
COPC in air (C_a)	chemical-specific	µg/m^3
Exposure Frequency (EF)	225	days/yr
Exposure Duration (ED)	25	yrs
Fraction of EF breathing air at site (ET)	0.333	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Inhalation Unit Risk (IUR)	chemical-specific	(µg/m^3)$^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}:

$$C_a = (C_s)(1{,}000\mu g/mg)(\frac{1}{VF} + \frac{1}{PEF})$$

where, if EPC > C_{sat}:

$$C_a = (C_s)(1000\mu g/mg)(\frac{1}{PEF}) + (C_{sat})(1000\mu g/mg)(\frac{1}{VF})$$

where, for inorganics:

$$C_a = (C_s)(1{,}000\mu g/mg)(\frac{1}{PEF})$$

Carcinogenic:

$$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic:

$$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC(1)	CAS Number(2)	Soil Exposure Point Concentration (3) (mg/kg) (4)	C_{sat} (5) (mg/kg)	Is EPC ≤ C_{sat} (6)?	Volatilization Factor (7) (m^3/kg) (8)	C_a (µg/m^3) (9)	Carcinogenic EC(air) (µg/m^3)	Noncarcinogenic EC(air) (µg/m^3)	IUR (10) (µg/m^3)$^{-1}$ (11)	RfC (12) (mg/m^3) (13)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides														
MCPA	94-74-6	9.4	1.1E+02	Yes	4.3E+05	2.2E-02	--	--	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	18000	N/A	N/A	N/A	1.4E-02	--	2.8E-03	--	5.0E-03	--	--	0.00056	8%
Arsenic	7440-38-2	6.3	N/A	N/A	N/A	4.8E-06	3.5E-07	9.8E-07	4.3E-03	1.5E-05	2E-09	85%	0.000066	0.9%
Cadmium	7440-43-9	2.6	N/A	N/A	N/A	2.0E-06	1.5E-07	4.1E-07	1.8E-03	1.0E-05	3E-10	15%	0.000041	0.6%
Cobalt	7440-48-4	44.0	N/A	N/A	N/A	3.3E-05	--	6.9E-06	9.0E-03	6.0E-06	--	--	0.0011	16%
Manganese	7439-96-5	1700	N/A	N/A	N/A	1.3E-03	--	2.7E-04	--	5.0E-05	--	--	0.0053	74%
Vanadium	7440-62-2	33	N/A	N/A	N/A	2.5E-05	--	5.1E-06	--	1.0E-04	--	--	0.000051	0.7%
											Cancer Risk		**Hazard Index**	
										Pathway Sums:	2E-09	100%	0.0072	100%
Chromium (14)														
Chromium (III)	16065-83-1	29	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	29	N/A	N/A	N/A	2.2E-05	1.6E-06	4.4E-06	8.4E-02	1.0E-04	1.3E-07	99% (15)	0.000044	1% (16)
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	2E-09	--	0.0072	--
										Pathway Sums (including Chromium (VI)):	1E-07	--	0.0072	--

Table B.5.9

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

(4) mg/kg = milligram per kilogram

(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.

(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) $\mu g/m^3$ = micrograms per cubic meter.

(10) IUR is the inhalation unit risk.   IUR values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.

(12) RfC is the reference concentration. RfC values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

Table B.5.10

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Incidental Soil Ingestion Rate, adult (IRS_a)	100	mg/day
Incidental Soil Ingestion Rate, child (IRS_c)	200	mg/day
Age-adjusted soil ingestion factor (IFS_{adj})	105	(mg-year)/(kg-day)
Exposure Frequency (EF)	24	days/yr
Exposure Duration, adult (ED_a)	20	yrs
Exposure Duration, child (ED_c)	6	yrs
Conversion Factor (CF)	0.000001	kg/mg
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

For carcinogenic analytes the intake is calculated as:

$$Intake = \frac{(C_s)(IFS_{adj})(EF)(CF)}{(AT)(365\ day/year)}$$

where: $$IFS_{adj} = \frac{(ED_c)(IRS_c)}{(BW_c)} + \frac{(ED_a)(IRS_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$Intake_{child} = \frac{(C_s)(IRS_c)(EF)(ED_c)(CF)}{(BW_c)(AT_{child})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_s)(IRS_a)(EF)(ED_a)(CF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC(1)	CAS Number(2)	Exposure Point Concentration (3) (mg/kg) (4)	Carcinogenic Intake (mg/kg-day) (5)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SFo (6) $(mg/kg\text{-}day)^{-1}$ (7)	RfDo (8) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds													
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--
Herbicides													
MCPA	94-74-6	9.4	--	0.00001	0.000001	--	5.0E-04	--	--	0.016	8%	0.002	8%
Metals													
Aluminum	7429-90-5	18000	--	0.01578082	0.00147945	--	1.0E+00	--	--	0.016	8%	0.0015	8%
Arsenic	7440-38-2	6.3	6.2E-07	0.00000552	0.00000052	1.5E+00	3.0E-04	9.3E-07	100%	0.018	9%	0.0017	9%
Cadmium	7440-43-9	2.6	--	0.00000229	0.00000021	--	1.0E-03	--	--	0.00	1%	0.000	1%
Cobalt	7440-48-4	44		0.00003858	0.00000362	--	3.0E-04	--	--	0.129	65%	0.0121	65%
Manganese	7439-96-5	1700	--	0.00149041	0.00013973	--	1.4E-01	--	--	0.0106	5.4%	0.00100	5.4%
Vanadium	7440-62-2	33	--	0.00002869	0.00000269	--	5.0E-03	--	--	0.0057	2.9%	0.00054	2.9%
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums:	9.3E-07	100%	0.2	100%	0.02	100%
Chromium (9)													
Chromium (III)	16065-83-1	29	--	0.00002499	0.00000234	--	1.5E+00	--	--	0.000017	0.0084% (10)	0.0000016	0.0084% (10)
Chromium (VI)	18540-29-9	29	2.8E-06	0.00002	0.000002	5.0E-01	3.0E-03	1.4E-06	60% (11)	0.008	4.0% (12)	0.0008	4.0% (12)
								Cancer Risk		**Hazard Index**		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	9.3E-07	--	0.20	--	0.019	--
							Pathway Sums (including Chromium (VI)):	2.3E-06	--	0.21	--	0.019	--

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

(4) mg/kg = milligram per kilogram

(5) mg/kg-day = milligram per kilogram-day.

(6) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(7) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(8) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(9) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(10) Percent increase in cumulative hazard due to chromium (III).

(11) Percent increase in cumulative risk due to chromium (VI).

(12) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

Table B.5.11
CURRENT AND FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE SOIL (0-≤2')
Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	24	days/yr
Exposure Duration, adult (Ed_a)	20	yrs
Exposure Duration, child (Ed_c)	6	yrs
Event Frequency (EV)	1	event/day
Skin Surface Area, adult (SA_a)	6032	cm^2
Skin Surface Area, child (SA_c)	2690	cm^2
Age-adjusted dermal contact factor (SFS_{adj})	320.76	(mg-year)/(kg-day)
Dermal Adherence Factor, adult (AF_a)	0.07	mg/cm^2-day
Dermal Adherence Factor, child (AF_c)	0.2	mg/cm^2-day
Dermal Absorption Factor (ABS)	chemical-specific	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Body Weight, child (BW_c)	15	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_d)	chemical-specific	mg/kg-day
Conversion Factor (CF)	0.000001	kg/mg
Oral Absorption Factor (OAF)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(C_s)(SFS_{adj})(ABS)(EF)(EV)(CF)}{(AT)(365\,days/year)}$$

where: $$SFS_{adj} = \frac{(ED_c)(AF_c)(SA_c)}{(BW_c)} + \frac{(ED_a)(AF_a)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(C_s)(ED_c)(AF_c)(SA_c)(ABS)(EF)(EV)(CF)}{(BW_c)(AT_{child})(365\,days/year)}$$

$$DAD_{adult} = \frac{(C_s)(ED_a)(AF_a)(SA_a)(ABS)(EF)(EV)(CF)}{(BW_a)(AT_{adult})(365\,days/year)}$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / Rf_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (mg/kg) (4)	ABS (5) (unitless)	GIABS (6) (unitless)	SFo (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfDo (9) (mg/kg-day) (10)	SF_d (11) $(mg/kg\text{-}day)^{-1}$	RfD_d (12) (mg/kg-day)	Carcinogenic DAD (13) (mg/kg-day)	Noncarcinogenic DAD - Child (mg/kg-day)	Noncarcinogenic DAD - Adult (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Semivolatile Organic Compounds																	
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides																	
MCPA	94-74-6	9.4	0.1	1	--	5.0E-04	--	5.0E-04	--	2.2E-06	3.3E-07	--	--	0.0044	72%	0.00065	72%
Metals																	
Aluminum	7429-90-5	18000	--	1	--	1.0E+00	--	1.0E+00	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	6.3	0.03	1	1.5E+00	3.0E-04	1.5E+00	3.0E-04	5.7E-08	4.5E-07	6.6E-08	8.5E-08	100%	0.00149	24%	0.000219	24%
Cadmium	7440-43-9	2.6	0.001	0.025	--	1.0E-03	--	2.5E-05	--	6.2E-09	9.1E-10	--	--	0.00025	4%	0.000036	4%
Cobalt	7440-48-4	44.0	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	1700	--	0.04	--	1.4E-01	--	5.6E-03	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	33	--	0.026	--	5.0E-03	--	1.3E-04	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway sum:	8.5E-08	100%	0.0062	100%	0.00091	100%
Chromium (15)																	
Chromium (III)	16065-83-1	29	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	29	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--	--	--	--
												Cancer Risk		**Hazard Index**		**Hazard Index**	
											Pathway Sums (including Chromium(III)):	8.5E-08	--	0.0062	--	0.00091	--
											Pathway Sums (including Chromium (VI)):	8.5E-08	--	0.0062	--	0.00091	--

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.
(4) mg/kg = milligram per kilogram
(5) ABS values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, Exhibit 3-4 (USEPA, 2004).
(6) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) mg/kg-day = milligram per kilogram-day.
(11) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004).
SF_d values were calculated as Sf_o / GIABS.
(12) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004).
RfD_d values were calculated as RfD_o x GIABS.
(13) DAD = Dermally absorbed dose.
(15) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
-- = toxicity data not available.

Table B.5.12

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC in air (C_a)	chemical-specific	$\mu g/m^3$
COPC in surface soil (C_s)	chemical-specific	mg/kg
Exposure Frequency (EF)	24	days/yr
Exposure Duration (ED)	26	yrs
Fraction of EF breathing air at site (ET)	1	unitless
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	26	yrs
Inhalation Unit Risk (IUR)	chemical-specific	$(\mu g/m^3)^{-1}$
Inhalation Reference Concentration (RfC)	chemical-specific	mg/m^3
Volatilization Factor (VF)	chemical-specific	m^3/kg
Particulate emission factor (PEF)	1.32E+09	m^3/kg

Equations

$$EC(air) = \frac{(C_a)(EF)(ED)(ET)}{(AT)(365\ days/year)}$$

where, if EPC ≤ C_{sat}: $$C_a = (C_s)(1{,}000\mu g/mg)\left(\frac{1}{VF} + \frac{1}{PEF}\right)$$

where, if EPC > C_{sat}: $$C_a = (C_s)(1000\mu g/mg)\left(\frac{1}{PEF}\right) + (C_{sat})(1000\mu g/mg)\left(\frac{1}{VF}\right)$$

where, for inorganics: $$C_a = (C_s)(1{,}000\mu g/mg)\left(\frac{1}{PEF}\right)$$

Carcinogenic: $$Risk_{inh} = EC(air) \times IUR$$

Noncarcinogenic: $$HQ_{inh} = \frac{EC(air)}{(RfC)(1{,}000\ \mu g/mg)}$$

COPC[1]	CAS Number[2]	Soil Exposure Point Concentration [3] (mg/kg) [4]	C_{sat} [5] (mg/kg)	Is EPC ≤ C_{sat} [6]?	Volatilization Factor [7] (m^3/kg) [8]	C_a ($\mu g/m^3$) [9]	Carcinogenic EC(air) ($\mu g/m^3$)	Noncarcinogenic EC(air) ($\mu g/m^3$)	IUR [10] $(\mu g/m^3)^{-1}$ [11]	RfC [12] (mg/m^3) [13]	Cancer Risk	% of Total	Hazard Quotient	% of Total
Semivolatile Organic Compounds														
Phenanthrene	85-01-8	0.018	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides														
MCPA	94-74-6	9.4	1.1E+02	Yes	4.3E+05	2.2E-02	--	--	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	18000	N/A	N/A	N/A	1.4E-02	--	9.0E-04	--	5.0E-03	--	--	0.00018	7.8%
Arsenic	7440-38-2	6.3	N/A	N/A	N/A	4.8E-06	1.2E-07	3.1E-07	4.3E-03	1.5E-05	5E-10	85%	0.000021	0.91%
Cadmium	7440-43-9	2.6	N/A	N/A	N/A	2.0E-06	4.9E-08	1.3E-07	1.8E-03	1.0E-05	9E-11	15%	0.000013	0.57%
Cobalt	7440-48-4	44.0	N/A	N/A	N/A	3.3E-05	--	2.2E-06	9.0E-03	6.0E-06	--	--	0.00037	16%
Manganese	7439-96-5	1700	N/A	N/A	N/A	1.3E-03	--	8.5E-05	--	5.0E-05	--	--	0.0017	74%
Vanadium	7440-62-2	33	N/A	N/A	N/A	2.5E-05	--	1.6E-06	--	1.0E-04	--	--	0.000016	0.71%
											Cancer Risk		**Hazard Index**	
										Pathway sum:	6E-10	100%	0.0023	100%
Chromium [14]														
Chromium (III)	16065-83-1	29	N/A	N/A	N/A	--	--	--	--	--	--	--	--	--
Chromium (VI)	18540-29-9	29	N/A	N/A	N/A	2.2E-05	5.3E-07	1.4E-06	8.4E-02	1.0E-04	4E-08	99% [15]	0.000014	0.62% [16]
											Cancer Risk		**Hazard Index**	
										Pathway Sums (including Chromium(III)):	6E-10		0.0023	
										Pathway Sums (including Chromium (VI)):	5E-08		0.0023	

Table B.5.12

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INHALATION OF VOLATILES/FUGITIVE DUST FROM SURFACE SOIL (0-≤2')

Kickout Area - Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the 95% UCL or the maximum detected concentration. See Table 2.11.

(4) mg/kg = milligram per kilogram

(5) C_{sat} is the soil saturation concentration. C_{sat} is caluclated for organic COPCs only. See Table B.3.3 for the calculation of C_{sat}.

(6) Chemical-specific soil saturation concentrations must be compared with the concentration of each volatile soil COPC because a basic principle of the VF calculation is not applicable when free-phase contaminants are present. Therefore, the VF is applicable only if the soil COPC concentration is at or below the soil saturation concentration.

(7) See Table B.3.2 for the calculation of VF.

(8) m^3/kg = cubic meters per kilogram.

(9) µg/m^3 = micrograms per cubic meter.

(10) IUR is the inhalation unit risk. IUR values

(11) $(\mu g/m^3)^{-1}$ = inverse of micrograms per cubic meter.

(12) RfC is the reference concentration. RfC

(13) mg/m^3 = milligrams per cubic meter.

(14) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(15) Percent increase in cumulative risk due to chromium (VI).

(16) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

N/A - Not Applicable. C_{sat} is caluclated for organic COPCs only.

B.6 Surface Water Risk Characterization Calculations

- B.6.1 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Surface Water, Upstream of OD Grounds
- B.6.2 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Upstream of OD Grounds
- B.6.3 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Surface Water, Upstream of OD Grounds
- B.6.4 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Upstream of OD Grounds
- B.6.5 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Surface Water, Upstream of OD Grounds
- B.6.6 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Upstream of OD Grounds
- B.6.7 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Surface Water, Upstream of OD Grounds
- B.6.8 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Upstream of OD Grounds
- B.6.9 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.10 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.11 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.12 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.13 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.14 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.15 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.16 Future Recreational User, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Drainage Ditch Samples from OD Hill Area
- B.6.17 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Surface Water, Reeder Creek Samples from Kickout Area plus Downstream Samples
- B.6.18 Hypothetical Future Resident, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Reeder Creek Samples from Kickout Area plus Downstream Samples
- B.6.19 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates-Incidental Ingestion of Surface Water, Reeder Creek Samples from Kickout Area plus Downstream Samples
- B.6.20 Hypothetical Future Excavation/Construction Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Dermal Contact with Surface Water, Reeder Creek Samples from Kickout Area plus Downstream Samples
- B.6.21 Future Park Worker, Carcinogenic and Noncarcinogenic Risk Estimates- Incidental Ingestion of Surface Water, Reeder Creek Samples from Kickout Area plus Downstream Samples

Table B.6.1
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER
Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Surface Water (C_W)	hemical-specific	mg/L
Age-adjusted Surface Water Ingestion Rate (IFW_{adj})	0.013	L-yr/kg-day
Surface Water Ingestion Rate, child (IRW_c)	0.02	L/day
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	175	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	hemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	hemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds														
1,2-Dichloroethane	107-06-2	5 U	NC	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives														
RDX	121-82-4	0.12 U	NC	NC	NC	NC	1.1E-01	3.0E-03	--	--	--	--	--	--
Metals														
Aluminum	7429-90-5	140	0.1400	--	8.9E-05	1.7E-05	--	1.0E+00	--	--	0.00009	0.472%	0.000017	0.472%
Arsenic	7440-38-2	3.6 U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	48.3	0.0483		3.1E-05	5.8E-06	--	2.0E-01			0.00015	0.814%	0.000029	0.814%
Cadmium	7440-43-9	0.88	0.0009	--	5.6E-07	1.1E-07	--	5.0E-04	--	--	0.00113	5.933%	0.000211	5.933%
Cobalt	7440-48-4	1.70 U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3	0.0030	--	1.9E-06	3.6E-07	--	4.0E-02	--	--	0.00005	0.253%	0.000009	0.253%
Cyanide	57-12-5	10	0.0100		6.4E-06	1.2E-06	--	6.0E-04			0.01065	56.188%	0.001998	56.188%
Manganese	7439-96-5	69.4	0.0694	--	4.4E-05	8.3E-06	--	2.4E-02	--	--	0.00185	9.749%	0.000347	9.749%
Mercury	7487-94-7	0.10 U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	15.9 U	NC		NC	NC		2.0E-02			--	--	--	--
Vanadium	7440-62-2	39.2	0.0392	--	2.5E-05	4.7E-06	--	5.0E-03	--	--	0.00501	26.431%	0.000940	26.431%
Zinc	7440-66-6	14.3	0.0143	--	9.1E-06	1.7E-06	--	3.0E-01	--	--	0.00003	0.161%	0.000006	0.161%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	0E+00	0%	0.0190	100%	0.0036	100%
Chromium (10)														
Chromium (III)	16065-83-1	6.1 U	NC	--	NC	NC	--	1.5E+00	--	--	--	-- (11)	--	-- (11)
Chromium (VI)	18540-29-9	6.1 U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	-- (12)	--	-- (13)	--	-- (13)
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	0E+00	--	2E-02	--	4E-03	--
								Pathway Sums (including Chromium (VI)):	0E+00	--	2E-02	--	4E-03	--

Table B.6.1

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.2

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	452,200	events-cm^2/kg
Exposure Frequency (EF)	175	days/yr
Event Duration (t_{event}) - child	2	hours/event
Event Duration (t_{event}) - adult	2	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26 years]	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	2690	cm^2
Exposed Skin Surface Area, adult (SA_a)	6032	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\ days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds																								
1,2-Dichloroethane	107-06-2	5 U	NC	0.0042	0.90	No	1	0.38	0.016	NC	NC	NC	NC	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives																								
RDX	121-82-4	0.12 U	NC	0.000336	4.4	Yes	1	1.8	0.0019	NC	NC	NC	NC	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	--	--	--	--	--	--
METALS																								
Aluminum	7429-90-5	140	0.0001400	0.001	0.36	N/A	1	0.15	0.0020	2.80E-07	--	2.4E-05	1.0E-05	1	--	1.00E+00	--	1.0E+00	--	--	0.000024	0.033%	0.0000	0.03%
Arsenic	7440-38-2	3.6 U	NC	0.001	0.66	N/A	1	0.28	0.0033	NC	NC	NC	NC	1	1.50E+00	3.00E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	48.3	0.0000483	0.001	1.5	N/A	1	0.62	0.0045	9.66E-08	--	8.3E-06	3.5E-06	0.07	--	2.00E-01	--	1.4E-02	--	--	0.00059	0.81%	0.0002	0.81%
Cadmium	7440-43-9	0.88	0.0000009	0.001	1.1	N/A	1	0.45	0.0041	1.76E-09	--	1.5E-07	6.4E-08	0.05	--	5.00E-04	--	2.5E-05	--	--	0.0061	8.2%	0.003	8.24%
Cobalt	7440-48-4	1.70 U	NC	0.0004	0.54	N/A	1	0.22	0.0012	NC	--	NC	NC	1	--	3.00E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3	0.0000030	0.001	0.57	N/A	1	0.24	0.0031	6.00E-09	--	5.2E-07	2.2E-07	1	--	4.00E-02	--	4.0E-02	--	--	0.000013	0.018%	0.0000	0.02%
Cyanide	57-12-5	10	0.0000100	0.001	0.35	N/A	1	0.15	0.0020	2.00E-08	--	1.7E-06	7.2E-07	1	--	6.00E-04	--	6.0E-04	--	--	0.0029	3.90%	0.0012	3.90%
Manganese	7439-96-5	69.4	0.0000694	0.001	0.51	N/A	1	0.21	0.0029	1.39E-07	--	1.2E-05	5.0E-06	0.04	--	2.40E-02	--	9.6E-04	--	--	0.012	16.9%	0.005	16.93%
Mercury	7487-94-7	0.10 U	NC	0.001	8.4	N/A	1	3.5	0.0063	NC	--	NC	NC	0.07	--	3.00E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	15.9 U	NC	0.0002	0.54	N/A	1	0.22	0.00059	NC	--	NC	NC	0.04	--	2.00E-02	--	8.0E-04	--	--	--	--	--	--
Vanadium	7440-62-2	39.2	0.0000392	0.001	0.49	N/A	1	0.20	0.0027	7.84E-08	--	6.7E-06	2.8E-06	0.026	--	5.04E-03	--	1.3E-04	--	--	0.051	70%	0.0	70.06%
Zinc	7440-66-6	14.3	0.0000143	0.0006	0.59	N/A	1	0.24	0.0019	1.72E-08	--	1.5E-06	6.2E-07	1	--	3.00E-01	--	3.0E-01	--	--	0.0000049	0.0067%	0.00000	0.01%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	0.0E+00	0%	0.1	100%	0.0	100%
Chromium [18]																								
Chromium (III)	16065-83-1	6.1 U	NC	0.001	0.49	N/A	1	0.21	0.0028	NC	--	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI)	18540-29-9	6.1 U	NC	0.002	0.49	N/A	1	0.21	0.01	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	0.0E+00		0.1		0.0	
																		Pathway Sums (including Chromium (VI)):	0.0E+00		0.1		0.0	

Table B.6.2
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.3

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Surface Water (C_W)	chemical-specific	mg/L
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds											
1,2-Dichloroethane	107-06-2	5 U	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--
Explosives											
RDX	121-82-4	0.12 U	NC	NC	NC	1.1E-01	3.0E-03	--	--	--	--
Metals											
Aluminum	7429-90-5	140	0.1400	--	2.9E-06	--	1.0E+00	--	--	0.00000	0.5%
Arsenic	7440-38-2	3.6 U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	48.3	0.0483	--	9.9E-07		2.0E-01			0.00000	0.8%
Cadmium	7440-43-9	0.88	0.0009	--	1.8E-08	--	5.0E-04	--	--	0.00004	5.9%
Cobalt	7440-48-4	1.70 U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3	0.0030	--	6.2E-08	--	4.0E-02	--	--	0.00000	0.3%
Cyanide	57-12-5	10	0.0100	--	2.1E-07		6.0E-04			0.00034	56.2%
Manganese	7439-96-5	69.4	0.0694	--	1.4E-06	--	2.4E-02	--	--	0.0001	9.7%
Mercury	7487-94-7	0.10 U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	15.9 U	NC	--	NC		2.0E-02			--	--
Vanadium	7440-62-2	39.2	0.0392	--	8.1E-07	--	5.0E-03	--	--	0.000	26.4%
Zinc	7440-66-6	14.3	0.0143	--	2.9E-07	--	3.0E-01	--	--	0.000001	0.2%
								Cancer Risk		**Hazard Index**	
							Pathway Sums:	0E+00	0%	0.001	100%
Chromium [10]											
Chromium (III)	16065-83-1	6.1 U	NC	--	NC	--	1.5E+00	--	--	--	-- [11]
Chromium (VI)	18540-29-9	6.1 U	NC	NC	NC	5.0E-01	3.0E-03	--	-- [12]	--	-- [13]
								Cancer Risk		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	0E+00	--	0.001	
							Pathway Sums (including Chromium (VI)):	0E+00	--	0.001	

Table B.6.3

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.4

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds																					
1,2-Dichloroethane	107-06-2	5 U	NC	0.0042	0.90	No	1.0	0.38	0.016	NC	NC	NC	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--
Explosives																					
RDX	121-82-4	0.12 U	NC	0.000336	4.4	Yes	1.0	1.8	0.0019	NC	NC	NC	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	--	--	--	--
Metals																					
Aluminum	7429-90-5	140	0.000	0.0010	0.0010	N/A	1.0	1.0	0.15	5.6E-07	--	2.0E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.00000	0.05%
Arsenic	7440-38-2	3.6 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.50E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	48.3	0.00005	0.0010	1.5	N/A	1.0	0.62	0.0045	1.6E-07	--	5.6E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00004	1.067%
Cadmium	7440-43-9	0.88	0.000001	0.0010	1.1	N/A	1.0	0.45	0.0041	2.5E-09	--	9.1E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0004	9.7%
Cobalt	7440-48-4	1.70 U	NC	0.00040	0.54	N/A	1.0	0.22	0.0012	NC	--	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3	0.000003	0.0010	0.57	N/A	1.0	0.24	0.0031	7.4E-09	--	2.6E-08	1	--	4.0E-02	--	4.0E-02	--	--	0.00000	0.018%
Cyanide	57-12-5	10	0.000010	0.0010	0.57	N/A	1.0	0.15	0.0020	2.3E-08	--	8.2E-08	1	--	6.0E-04	--	6.0E-04	--	--	0.00014	3.65%
Manganese	7439-96-5	69.4	0.0001	0.0010	0.51	N/A	1.0	0.21	0.0029	1.7E-07	--	6.0E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.001	16.8%
Mercury	7487-94-7	0.10 U	NC	0.0010	8.4	N/A	1.0	3.5	0.0063	NC	--	NC	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	15.9 U	NC	0.00020	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Vanadium	7440-62-2	39.2	0.0000	0.0010	0.49	N/A	1.0	0.20	0.0027	9.4E-08	--	3.4E-07	0.03	--	5.0E-03	--	1.3E-04	--	--	0.00	69%
Zinc	7440-66-6	14.3	0.00001	0.00060	0.59	NA	1.0	0.24	0.0019	2.1E-08	--	7.6E-08	1	--	3.0E-01	--	3.0E-01	--	--	0.000000	0.0068%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00	0%	0.00	100%
Chromium [18]																					
Chromium (III)	16065-83-1	6.1 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	NC	0.01	--	1.5E+00	--	2.0E-02	--	--	--	-- [19]
Chromium (VI)	18540-29-9	6.1 U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	-- [20]	--	-- [21]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00		0.00	
																	Pathway Sums (including Chromium (VI)):	0E+00		0.00	

Table B.6.4
HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(19) Percent increase in cumulative hazard due to chromium (III).
(20) Percent increase in cumulative risk due to chromium (VI).
(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.5
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Surface Water (C_W)	chemical-specific	mg/L
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	113	days/yr
Exposure Duration (ED)	25	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds												
1,2-Dichloroethane	107-06-2	5	U	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--
Explosives												
RDX	121-82-4	0.12	U	NC	NC	NC	1.1E-01	3.0E-03	--	--	--	--
Metals												
Aluminum	7429-90-5	140		0	--	1.1E-05	--	1.0E+00	--	--	0.0000	0.5%
Arsenic	7440-38-2	3.6	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	48.3		0.05	--	3.7E-06	--	2.0E-01	--	--	0.00002	0.814%
Cadmium	7440-43-9	0.88		0.001	--	6.8E-08	--	5.0E-04	--	--	0.0001	5.9%
Cobalt	7440-48-4	1.70	U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3		0.00	--	2.3E-07	--	4.0E-02	--	--	0.0000	0.3%
Cyanide	57-12-5	10		0.010	--	7.7E-07	--	6.0E-04	--	--	0.0013	56.2%
Manganese	7439-96-5	69.4		0.1	--	5.4E-06	--	2.4E-02			0.0002	9.7%
Mercury	7487-94-7	0.10	U	NC	--	NC	--	3.0E-04	--	--	--	--
Nickel	7440-02-0	15.9	U	NC	--	NC	--	2.0E-02	--	--	--	--
Vanadium	7440-62-2	39.2		0.0	--	3.0E-06	--	5.0E-03			0.001	26%
Zinc	7440-66-6	14.3		0.01	--	1.1E-06	--	3.0E-01	--	--	0.00000	0.16%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	0E+00	0%	0.00	100%
Chromium [10]												
Chromium (III)	16065-83-1	6.1	U	NC	--	NC	--	1.5E+00	--	--	--	-- [11]
Chromium (VI)	18540-29-9	6.1	U	NC	NC	NC	5.0E-01	3.0E-03	--	-- [12]	--	-- [13]
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	0E+00	--	0.00	--
								Pathway Sums (including Chromium (VI)):	0E+00	--	0.00	--

[1] COPC = Constituent of potential concern.
[2] CAS = Chemical Abstracts Service number.
[3] Exposure point concentration is the maximum detected concentration. See Table 2.13.
[4] µg/L = microgram per liter.
[5] mg/L = milligram per liter.
[6] mg/kg-day = milligram per kilogram-day.
[7] SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[8] $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
[9] RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
[10] Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
[11] Percent increase in cumulative hazard due to chromium (III).
[12] Percent increase in cumulative risk due to chromium (VI).
[13] Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.6

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	113	days/yr
Event Duration (t_{event})	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds																					
1,2-Dichloroethane	107-06-2	5 U	NC	0.0042	0.90	No	1.0	0.38	0.016	NC	--	--	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--
Explosives																					
RDX	121-82-4	0.12 U	NC	0.000336	4.4	Yes	1.0	1.8	0.0019	NC	--	--	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	--	--	--	#VALUE!
Metals																					
Aluminum	7429-90-5	140	0.000	0.0010	0.0010	N/A	1.0	1.0	0.15	2.8E-07	--	1.5E-07	1	--	1.0E+00	--	1.0E+00	--	--	0.000000	0.03%
Arsenic	7440-38-2	3.6 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	--	--	1	1.50E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	48.3	0.00005	0.0010	1.5	N/A	1.0	0.62	0.0045	9.7E-08	--	5.2E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000004	0.81%
Cadmium	7440-43-9	0.88	0.000001	0.0010	1.1	N/A	1.0	0.45	0.0041	1.8E-09	--	9.5E-10	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00004	8.24%
Cobalt	7440-48-4	1.70 U	NC	0.00040	0.54	N/A	1.0	0.22	0.0012	NC	--	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	3	0.00000	0.0010	0.57	N/A	1.0	0.24	0.0031	6.0E-09	--	3.2E-09	1	--	4.0E-02	--	4.0E-02	--	--	0.000000	0.02%
Cyanide	57-12-5	10	0.000010	0.0010	0.57	N/A	1.0	0.15	0.0020	2.0E-08	--	1.1E-08	1	--	6.0E-04	--	6.0E-04	--	--	0.000018	3.90%
Manganese	7439-96-5	69.4	0.000069	0.0010	0.51	N/A	1.0	0.21	0.0029	1.4E-07	--	7.5E-08	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0001	16.93%
Mercury	7487-94-7	0.10 U	NC	0.0010	8.4	N/A	1.0	3.5	0.0063	NC	--	--	0.07	--	3.0E-04	--	2.1E-05	--	--	--	--
Nickel	7440-02-0	15.9 U	NC	0.00020	0.54	N/A	1.0	0.22	0.0006	NC	--	--	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Vanadium	7440-62-2	39.2	0.0000	0.0010	0.49	N/A	1.0	0.20	0.0027	7.8E-08	--	4.2E-08	0.03	--	5.0E-03	--	1.3E-04	--	--	0.000	70.06%
Zinc	7440-66-6	14.3	0.00001	0.00060	0.59	NA	1.0	0.24	0.0019	1.7E-08	--	9.2E-09	1	--	3.0E-01	--	3.0E-01	--	--	0.0000000	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	0E+00	0%	0.000	#VALUE!
Chromium [18]																					
Chromium (III)	16065-83-1	6.1 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	--	0.01	--	1.5E+00	--	2.0E-02	--	--	--	-- [19]
Chromium (VI)	18540-29-9	6.1 U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	--	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	-- [20]	--	-- [21]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	0E+00	--	0.000	--
																	Pathway Sums (including Chromium (VI)):	0E+00	--	0.000	--

Table B.6.6
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) (mg/kg-day)$^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(19) Percent increase in cumulative hazard due to chromium (III).

(20) Percent increase in cumulative risk due to chromium (VI).

(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.7

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
COPC Concentration in Surface Water (C_W)	hemical-specific	mg/L
Age-adjusted Surface Water Ingestion Rate (IFW_{adj})	0.01	L-yr/kg-day
Surface Water Ingestion Rate, child (IRW_c)	0.02	L/day
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	hemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	hemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds															
1,2-Dichloroethane	107-06-2	5	U	NC	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives															
RDX	121-82-4	0.12	U	NC	NC	NC	NC	1.1E-01	3.0E-03	--	--	--	--	--	--
Metals															
Aluminum	7429-90-5	140		0.1400	--	1.2E-05	2.3E-06	--	1.0E+00	--	--	0.0000	0%	0.000	0.5%
Arsenic	7440-38-2	3.6	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	48.3		0.0483	--	4.2E-06	7.9E-07	--	2.0E-01	--	--	0.00002	0.81%	0.000	0.8%
Cadmium	7440-43-9	0.88		0.0009	--	7.7E-08	1.4E-08	--	5.0E-04	--	--	0.0002	5.93%	0.000	5.9%
Cobalt	7440-48-4	1.70	U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3		0.0030	--	2.6E-07	4.9E-08	--	4.0E-02	--	--	0.0000	0.25%	0.000	0.3%
Cyanide	57-12-5	10		0.0100	--	8.8E-07	1.6E-07	--	6.0E-04	--	--	0.0015	56%	0.000	56.2%
Manganese	7439-96-5	69.4		0.0694	--	6.1E-06	1.1E-06	--	2.4E-02	--	--	0.0003	9.75%	0.000	9.7%
Mercury	7487-94-7	0.10	U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Nickel	7440-02-0	15.9	U	NC	--	NC	NC		2.0E-02	--	--	--	--	--	--
Vanadium	7440-62-2	39.2		0.0392	--	3.4E-06	6.4E-07	--	5.0E-03	--	--	0.00	26%	0.000	26.4%
Zinc	7440-66-6	14.3		0.0143	--	1.3E-06	2.4E-07	--	3.0E-01	--	--	0.00000	0.16%	0.000	0.2%
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	0E+00	0%	3E-03	100%	5E-04	100%
Chromium (10)															
Chromium (III)	16065-83-1	6.1	U	NC	--	NC	NC	--	1.5E+00	--		--	-- (11)	--	-- (11)
Chromium (VI)	18540-29-9	6.1	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	-- (12)	--	-- (13)	--	-- (13)
									Pathway Sums (including Chromium(III)):	0E+00	--	0.00	--	0.000	--
									Pathway Sums (including Chromium (VI)):	0E+00	--	0.00	--	0.000	--

Table B.6.7

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.8

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	CURRENT AND FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	62,016	cm^2-yr/kg-day
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	2	hours/event
Event Duration (t_{event}) - adult	2	hours/event
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (EV_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	2690	cm^2
Exposed Skin Surface Area, adult (SA_a)	6032	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds																								
1,2-Dichloroethane	107-06-2	5 U	NC	0.0042	0.90	No	1.0	0.38	0.016	NC	--	--	--	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives																								
RDX	121-82-4	0.12 U	NC	0.000336	4.4	Yes	1.0	1.8	0.0019	NC	--	--	--	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	--	--	--	--	--	--
METALS																								
Aluminum	7429-90-5	140	0.000	0.0010	0.0010	N/A	1.0	1.0	0.15	2.8E-07	--	3.3E-06	1.4E-06	1	--	1.00E+00	--	1.0E+00	--	--	0.00000	0.033%	0.00000	0.033%
Arsenic	7440-38-2	3.6 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	--	--	--	1	1.50E+00	3.00E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	48.3	0.00005	0.0010	1.5	N/A	1.0	0.62	0.0045	9.7E-08	--	1.1E-06	4.8E-07	0.07	--	2.00E-01	--	1.4E-02	--	--	0.0001	0.81%	0.00003	0.81%
Cadmium	7440-43-9	0.88	0.000001	0.0010	1.1	N/A	1.0	0.45	0.0041	1.8E-09	--	2.1E-08	8.7E-09	0.05	--	5.00E-04	--	2.5E-05	--	--	0.001	8.2%	0.0003	8.2%
Cobalt	7440-48-4	1.70 U	NC	0.00040	0.54	N/A	1.0	0.22	0.0012	NC	--	--	--	1	--	3.00E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	3	0.00000	0.0010	0.57	N/A	1.0	0.24	0.0031	6.0E-09	--	7.1E-08	3.0E-08	1	--	4.00E-02	--	4.0E-02	--	--	0.00000	0.018%	0.00000	0.018%
Cyanide	57-12-5	10	0.000010	0.0010	0.57	N/A	1.0	0.15	0.0020	2.0E-08	--	2.4E-07	9.9E-08	1	--	6.00E-04	--	6.0E-04	--	--	0.0004	3.90%	0.00017	3.90%
Manganese	7439-96-5	69.4	0.0001	0.0010	0.51	N/A	1.0	0.21	0.0029	1.4E-07	--	1.6E-06	6.9E-07	0.04	--	2.40E-02	--	9.6E-04	--	--	0.002	16.9%	0.001	16.9%
Mercury	7487-94-7	0.10 U	NC	0.0010	8.4	N/A	1.0	3.5	0.0063	NC	--	--	--	0.07	--	3.00E-04	--	2.1E-05	--	--	--	--	--	--
Nickel	7440-02-0	15.9 U	NC	0.00020	0.54	N/A	1.0	0.22	0.0006	NC	--	--	--	0.04	--	2.00E-02	--	8.0E-04	--	--	--	--	--	--
Vanadium	7440-62-2	39.2	0.0000	0.0010	0.49	N/A	1.0	0.20	0.0027	7.8E-08	--	9.2E-07	3.9E-07	0.026	--	5.04E-03	--	1.3E-04	--	--	0.0	70%	0.00	70%
Zinc	7440-66-6	14.3	0.00001	0.00060	0.59	NA	1.0	0.24	0.0019	1.7E-08	--	2.0E-07	8.5E-08	1	--	3.00E-01	--	3.0E-01	--	--	0.000001	0.0067%	0.000000	0.0067%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	0.0E+00	0%	0.0	100%	0.00	100%
Chromium [18]																								
Chromium (III)	16065-83-1	6.1 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	--	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--	--	--
Chromium (VI) [18]	18540-29-9	6.1 U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	--	--	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--	--	--
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	0.0E+00	--	0.0	--	0.00	--
																		Pathway Sums (including Chromium (VI)):	0.0E+00	--	0.0	--	0.00	--

Table B.6.8

CURRENT AND FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Upstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.9
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Surface Water (C_W)	hemical-specific	mg/L
Age-adjusted Surface Water Ingestion Rate (IFW_{adj})	0.013	L-yr/kg-day
Surface Water Ingestion Rate, child (IRW_c)	0.02	L/day
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	175	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	hemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	hemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds														
1,2-Dichloroethane	107-06-2	10 U	NC	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives														
RDX	121-82-4	2	0.0020	1.8E-07	1.3E-06	2.4E-07	1.1E-01	3.0E-03	2.0E-08	6%	0.00043	0.218%	0.000080	0.218%
Metals														
Aluminum	7429-90-5	37,500	37.5000	--	2.4E-02	4.5E-03	--	1.0E+00	--	--	0.02397	12.270%	0.004495	12.270%
Arsenic	7440-38-2	2.3 J	0.0023	2.0E-07	1.5E-06	2.8E-07	1.5E+00	3.0E-04	3.1E-07	94%	0.00490	2.509%	0.000919	2.509%
Barium	7440-39-3	439	0.4390		2.8E-04	5.3E-05	--	2.0E-01	--	--	0.00140	0.718%	0.000263	0.718%
Cadmium	7440-43-9	11.2	0.0112	--	7.2E-06	1.3E-06	--	5.0E-04	--	--	0.01432	7.330%	0.002685	7.330%
Cobalt	7440-48-4	18.2	0.0182	--	1.2E-05	2.2E-06	--	3.0E-04	--	--	0.03878	19.851%	0.007272	19.851%
Copper	7440-50-8	612	0.6120	--	3.9E-04	7.3E-05	--	4.0E-02	--	--	0.00978	5.006%	0.001834	5.006%
Cyanide	57-12-5	47.7	0.0477		3.0E-05	5.7E-06	--	6.0E-04	--	--	0.05082	26.013%	0.009529	26.013%
Manganese	7439-96-5	1,250	1.2500	--	8.0E-04	1.5E-04	--	2.4E-02	--	--	0.03330	17.042%	0.006243	17.042%
Mercury	7487-94-7	3.0	0.0030	--	1.9E-06	3.6E-07	--	3.0E-04	--	--	0.00639	3.272%	0.001199	3.272%
Nickel	7440-02-0	74.2	0.0742		4.7E-05	8.9E-06		2.0E-02	--	--	0.00237	1.214%	0.000445	1.214%
Vanadium	7440-62-2	54.9	0.0549	--	3.5E-05	6.6E-06	--	5.0E-03	--	--	0.00702	3.593%	0.001316	3.593%
Zinc	7440-66-6	883	0.8830	--	5.6E-04	1.1E-04	--	3.0E-01	--	--	0.00188	0.963%	0.000353	0.963%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	3E-07	100%	0.1954	100%	0.0366	100%
Chromium [10]														
Chromium (III)	16065-83-1	50.8	0.0508	--	3.2E-05	6.1E-06	--	1.5E+00	--	--	0.00002	0.0111% [11]	0.000004	0.0111% [11]
Chromium (VI)	18540-29-9	50.8	0.0508	4.5E-06	3.2E-05	6.1E-06	5.0E-01	3.0E-03	2.3E-06	87% [12]	0.01082	5.2% [13]	0.002030	5.2% [13]
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	3E-07	--	2E-01	--	4E-02	--
								Pathway Sums (including Chromium (VI)):	3E-06	--	2E-01	--	4E-02	--

Table B.6.9

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.10
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	452,200	events-cm^2/kg
Exposure Frequency (EF)	175	days/yr
Event Duration (t_{event}) - child	2	hours/event
Event Duration (t_{event}) - adult	2	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26 years]	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	2690	cm^2
Exposed Skin Surface Area, adult (SA_a)	6032	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where:

$$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds																								
1,2-Dichloroethane	107-06-2	10 U	NC	0.0042	0.90	No	1	0.38	0.016	NC	NC	NC	NC	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives																								
RDX	121-82-4	2	0.0000020	0.000336	4.4	Yes	1	1.8	0.0019	3.6E-09	6.3E-08	3.1E-07	1.3E-07	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	6.9E-09	5%	0.0001	0.0235%	0.000043	0.02%
METALS																								
Aluminum	7429-90-5	37,500	0.0375000	0.001	0.36	N/A	1	0.15	0.0020	7.50E-05	--	6.4E-03	2.7E-03	1	--	1.00E+00	--	1.0E+00	--	--	0.0064	1.483%	0.0027	1.48%
Arsenic	7440-38-2	2.3 J	0.0000023	0.001	0.66	N/A	1	0.28	0.0033	4.60E-09	8.1E-08	4.0E-07	1.7E-07	1	1.50E+00	3.00E-04	1.5E+00	3.0E-04	1.2E-07	95%	0.0013	0.303%	0.00055	0.30%
Barium	7440-39-3	439	0.0004390	0.001	1.5	N/A	1	0.62	0.0045	8.78E-07	--	7.5E-05	3.2E-05	0.07	--	2.00E-01	--	1.4E-02	--	--	0.0054	1.24%	0.0023	1.24%
Cadmium	7440-43-9	11.2	0.0000112	0.001	1.1	N/A	1	0.45	0.0041	2.24E-08	--	1.9E-06	8.1E-07	0.05	--	5.00E-04	--	2.5E-05	--	--	0.077	17.7%	0.032	17.72%
Cobalt	7440-48-4	18.2	0.0000182	0.0004	0.54	N/A	1	0.22	0.0012	1.46E-08	--	1.3E-06	5.3E-07	1	--	3.00E-04	--	3.0E-04	--	--	0.0042	0.960%	0.0018	0.96%
Copper	7440-50-8	612	0.0006120	0.001	0.57	N/A	1	0.24	0.0031	1.22E-06	--	1.1E-04	4.4E-05	1	--	4.00E-02	--	4.0E-02	--	--	0.0026	0.605%	0.0011	0.61%
Cyanide	57-12-5	47.7	0.0000477	0.001	0.35	N/A	1	0.15	0.0020	9.54E-08	--	8.2E-06	3.4E-06	1	--	6.00E-04	--	6.0E-04	--	--	0.014	3.14%	0.0057	3.14%
Manganese	7439-96-5	1,250	0.0012500	0.001	0.51	N/A	1	0.21	0.0029	2.50E-06	--	2.1E-04	9.0E-05	0.04	--	2.40E-02	--	9.6E-04	--	--	0.22	51.5%	0.094	51.50%
Mercury	7487-94-7	3.0	0.0000030	0.001	8.4	N/A	1	3.5	0.0063	6.00E-09	--	5.2E-07	2.2E-07	0.07	--	3.00E-04	--	2.1E-05	--	--	0.025	5.65%	0.010	5.65%
Nickel	7440-02-0	74.2	0.0000742	0.0002	0.54	N/A	1	0.22	0.00059	2.97E-08	--	2.6E-06	1.1E-06	0.04	--	2.00E-02	--	8.0E-04	--	--	0.0032	0.734%	0.0013	0.73%
Vanadium	7440-62-2	54.9	0.0000549	0.001	0.49	N/A	1	0.20	0.0027	1.10E-07	--	9.4E-06	4.0E-06	0.026	--	5.04E-03	--	1.3E-04	--	--	0.1	17%	0.0	16.57%
Zinc	7440-66-6	883	0.0008830	0.0006	0.59	N/A	1	0.24	0.0019	1.06E-06	--	9.1E-05	3.8E-05	1	--	3.00E-01	--	3.0E-01	--	--	0.00030	0.0698%	0.00013	0.07%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.3E-07	100%	0.4	100%	0.2	100%
Chromium [18]																								
Chromium (III)	16065-83-1	50.8	0.0000508	0.001	0.49	N/A	1	0.21	0.0028	1.02E-07	--	8.7E-06	3.7E-06	0.013	--	1.5E+00	--	2.0E-02	--	--	0.00045	0% [19]	0.000	0.103% [19]
Chromium (VI)	18540-29-9	50.8	0.0000508	0.002	0.49	N/A	1	0.21	0.01	2.03E-07	3.6E-06	1.7E-05	7.3E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	7.2E-05	100% [20]	0.23	35% [21]	0.10	35% [21]
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	1.3E-07		0.4		0.2	
																		Pathway Sums (including Chromium (VI)):	7.2E-05		0.7		0.3	

Table B.6.10
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.
(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(19) Percent increase in cumulative hazard due to chromium (III).
(20) Percent increase in cumulative risk due to chromium (VI).
(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.11

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Surface Water (C_W)	chemical-specific	mg/L
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds											
1,2-Dichloroethane	107-06-2	10 U	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--
Explosives											
RDX	121-82-4	2	0.0020	5.9E-10	4.1E-08	1.1E-01	3.0E-03	6.5E-11	6%	0.000014	0.2%
Metals											
Aluminum	7429-90-5	37,500	37.5000	--	7.7E-04	--	1.0E+00	--	--	0.00077	12.3%
Arsenic	7440-38-2	2.3 J	0.0023	6.8E-10	4.7E-08	1.5E+00	3.0E-04	1.0E-09	94%	0.00016	2.5%
Barium	7440-39-3	439	0.4390		9.0E-06		2.0E-01			0.00005	0.7%
Cadmium	7440-43-9	11.2	0.0112	--	2.3E-07	--	5.0E-04	--	--	0.00046	7.3%
Cobalt	7440-48-4	18.2	0.0182	--	3.7E-07	--	3.0E-04	--	--	0.00125	19.9%
Copper	7440-50-8	612	0.6120	--	1.3E-05	--	4.0E-02	--	--	0.00031	5.0%
Cyanide	57-12-5	47.7	0.0477		9.8E-07		6.0E-04			0.00163	26.0%
Manganese	7439-96-5	1,250	1.2500	--	2.6E-05	--	2.4E-02	--	--	0.0011	17.0%
Mercury	7487-94-7	3.0	0.0030	--	6.2E-08	--	3.0E-04	--	--	0.00021	3.3%
Nickel	7440-02-0	74.2	0.0742		1.5E-06		2.0E-02			0.00008	1.2%
Vanadium	7440-62-2	54.9	0.0549	--	1.1E-06	--	5.0E-03	--	--	0.000	3.6%
Zinc	7440-66-6	883	0.8830	--	1.8E-05	--	3.0E-01	--	--	0.000060	1.0%
								Cancer Risk		**Hazard Index**	
							Pathway Sums:	1E-09	100%	0.006	100%
Chromium [10]											
Chromium (III)	16065-83-1	50.8	0.0508	--	1.0E-06	--	1.5E+00	--	--	0.00000070	0.0111% [11]
Chromium (VI)	18540-29-9	50.8	0.0508	1.5E-08	1.0E-06	5.0E-01	3.0E-03	7.5E-09	87% [12]	0.00035	5.2% [13]
								Cancer Risk		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	1E-09	--	0.006	
							Pathway Sums (including Chromium (VI)):	9E-09	--	0.007	

Table B.6.11

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.12

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	'HETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds																					
1,2-Dichloroethane	107-06-2	10 U	NC	0.0042	0.90	No	1.0	0.38	0.016	NC	NC	NC	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--
Explosives																					
RDX	121-82-4	2	0.0000020	0.000336	4.4	Yes	1.0	1.8	0.0019	3.6E-09	1.8E-10	1.3E-08	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	2.0E-11	4.3%	0.000004	0.0167%
Metals																					
Aluminum	7429-90-5	37,500	0.038	0.0010	0.0010	N/A	1.0	1.0	0.15	1.5E-04	--	5.4E-04	1	--	1.0E+00	--	1.0E+00	--	--	0.00054	2.13%
Arsenic	7440-38-2	2.3 J	0.0000023	0.0010	0.66	N/A	1.0	0.28	0.0033	5.9E-09	3.0E-10	2.1E-08	1	1.50E+00	3.0E-04	1.5E+00	3.0E-04	4.5E-10	96%	0.000070	0.275%
Barium	7440-39-3	439	0.00044	0.0010	1.5	N/A	1.0	0.62	0.0045	1.4E-06	--	5.1E-06	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00036	1.427%
Cadmium	7440-43-9	11.2	0.000011	0.0010	1.1	N/A	1.0	0.45	0.0041	3.2E-08	--	1.2E-07	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0046	18.2%
Cobalt	7440-48-4	18.2	0.000018	0.00040	0.54	N/A	1.0	0.22	0.0012	1.8E-08	--	6.4E-08	1	--	3.0E-04	--	3.0E-04	--	--	0.00021	0.837%
Copper	7440-50-8	612	0.000612	0.0010	0.57	N/A	1.0	0.24	0.0031	1.5E-06	--	5.4E-06	1	--	4.0E-02	--	4.0E-02	--	--	0.00013	0.533%
Cyanide	57-12-5	47.7	0.000048	0.0010	0.57	N/A	1.0	0.15	0.0020	1.1E-07	--	3.9E-07	1	--	6.0E-04	--	6.0E-04	--	--	0.00065	2.56%
Manganese	7439-96-5	1,250	0.0013	0.0010	0.51	N/A	1.0	0.21	0.0029	3.0E-06	--	1.1E-05	0.04	--	2.4E-02	--	9.6E-04	--	--	0.011	44.4%
Mercury	7487-94-7	3.0	0.0000030	0.0010	8.4	N/A	1.0	3.5	0.0063	2.2E-08	--	7.8E-08	0.07	--	3.0E-04	--	2.1E-05	--	--	0.0037	14.7%
Nickel	7440-02-0	74.2	0.000074	0.00020	0.54	N/A	1.0	0.22	0.0006	3.6E-08	--	1.3E-07	0.04	--	2.0E-02	--	8.0E-04	--	--	0.00016	0.639%
Vanadium	7440-62-2	54.9	0.0001	0.0010	0.49	N/A	1.0	0.20	0.0027	1.3E-07	--	4.7E-07	0.03	--	5.0E-03	--	1.3E-04	--	--	0.00	14%
Zinc	7440-66-6	883	0.00088	0.00060	0.59	NA	1.0	0.24	0.0019	1.3E-06	--	4.7E-06	1	--	3.0E-01	--	3.0E-01	--	--	0.000016	0.0618%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	5E-10	100%	0.03	100%
Chromium (18)																					
Chromium (III)	16065-83-1	50.8	0.000051	0.0010	0.49	N/A	1.0	0.21	0.0028	1.2E-07	--	4.4E-07	0.01	--	1.5E+00	--	2.0E-02	--	--	0.000022	0.0882% (19)
Chromium (VI)	18540-29-9	50.8	0.000051	0.0020	0.49	N/A	1.0	0.21	0.0055	2.4E-07	1.2E-08	8.7E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	2.5E-07	100% (20)	0.012	31.4% (21)
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	5E-10		0.03	
																	Pathway Sums (including Chromium (VI)):	2E-07		0.04	

Table B.6.12

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(19) Percent increase in cumulative hazard due to chromium (III).

(20) Percent increase in cumulative risk due to chromium (VI).

(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.13
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Surface Water (C_W)	chemical-specific	mg/L
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	113	days/yr
Exposure Duration (ED)	25	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds											
1,2-Dichloroethane	107-06-2	10 U	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--
Explosives											
RDX	121-82-4	2	0.0020	5.5E-08	1.5E-07	1.1E-01	3.0E-03	6.1E-09	6%	0.000052	0.218%
Metals											
Aluminum	7429-90-5	37,500	38	--	2.9E-03	--	1.0E+00	--	--	0.0029	12.3%
Arsenic	7440-38-2	2.3 J	0.0023	6.4E-08	1.8E-07	1.5E+00	3.0E-04	9.5E-08	94%	0.00059	2.5%
Barium	7440-39-3	439	0.44	--	3.4E-05	--	2.0E-01	--	--	0.00017	0.718%
Cadmium	7440-43-9	11.2	0.011	--	8.7E-07	--	5.0E-04	--	--	0.0017	7.3%
Cobalt	7440-48-4	18.2	0.018	--	1.4E-06	--	3.0E-04	--	--	0.0047	19.9%
Copper	7440-50-8	612	0.61	--	4.7E-05	--	4.0E-02	--	--	0.0012	5.0%
Cyanide	57-12-5	47.7	0.048	--	3.7E-06	--	6.0E-04	--	--	0.0062	26.0%
Manganese	7439-96-5	1,250	1.3	--	9.7E-05	--	2.4E-02			0.0040	17.0%
Mercury	7487-94-7	3.0	0.0030	--	2.3E-07	--	3.0E-04	--	--	0.00077	3.3%
Nickel	7440-02-0	74.2	0.074	--	5.7E-06	--	2.0E-02	--	--	0.00029	1.21%
Vanadium	7440-62-2	54.9	0.1	--	4.2E-06	--	5.0E-03			0.001	4%
Zinc	7440-66-6	883	0.88	--	6.8E-05	--	3.0E-01	--	--	0.00023	0.96%
								Cancer Risk		**Hazard Index**	
							Pathway Sums:	1E-07	100%	0.02	100%
Chromium [10]											
Chromium (III)	16065-83-1	50.8	0.051	--	3.9E-06	--	1.5E+00	--	--	0.0000026	0.010% [11]
Chromium (VI)	18540-29-9	50.8	0.051	1.4E-06	3.9E-06	5.0E-01	3.0E-03	7.0E-07	87% [12]	0.001	5% [13]
								Cancer Risk		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	1E-07	--	0.02	--
							Pathway Sums (including Chromium (VI)):	8E-07	--	0.02	--

Table B.6.13

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.

(2) CAS = Chemical Abstracts Service number.

(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.

(4) µg/L = microgram per liter.

(5) mg/L = milligram per liter.

(6) mg/kg-day = milligram per kilogram-day.

(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.

J = Analyte detected between MDL and practical quantitation limit (PQL).

U= Analyte not detected.

UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.14
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm²-event
Exposure Frequency (EF)	113	days/yr
Event Duration (t_{event})	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm²
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm³
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \leq t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm³) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \leq t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm²-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds																					
1,2-Dichloroethane	107-06-2	10 U	NC	0.0042	0.90	No	1.0	0.38	0.016	NC	--	--	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--
Explosives																					
RDX	121-82-4	2	0.0000020	0.000336	4.4	Yes	1.0	1.8	0.0019	3.6E-09	6.8E-10	1.9E-09	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	7.5E-11	5%	0.00000064	0.02%
Metals																					
Aluminum	7429-90-5	37,500	0.038	0.0010	0.0010	N/A	1.0	1.0	0.15	7.5E-05	--	4.0E-05	1	--	1.0E+00	--	1.0E+00	--	--	0.000040	1.48%
Arsenic	7440-38-2	2.3 J	0.0000023	0.0010	0.66	N/A	1.0	0.28	0.0033	4.6E-09	8.8E-10	2.5E-09	1	1.50E+00	3.0E-04	1.5E+00	3.0E-04	1.3E-09	95%	0.0000082	0.30%
Barium	7440-39-3	439	0.00044	0.0010	1.5	N/A	1.0	0.62	0.0045	8.8E-07	--	4.7E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000034	1.24%
Cadmium	7440-43-9	11.2	0.000011	0.0010	1.1	N/A	1.0	0.45	0.0041	2.2E-08	--	1.2E-08	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00048	17.72%
Cobalt	7440-48-4	18.2	0.000018	0.00040	0.54	N/A	1.0	0.22	0.0012	1.5E-08	--	7.8E-09	1	--	3.0E-04	--	3.0E-04	--	--	0.000026	0.96%
Copper	7440-50-8	612	0.00061	0.0010	0.57	N/A	1.0	0.24	0.0031	1.2E-06	--	6.6E-07	1	--	4.0E-02	--	4.0E-02	--	--	0.000016	0.61%
Cyanide	57-12-5	47.7	0.000048	0.0010	0.57	N/A	1.0	0.15	0.0020	9.5E-08	--	5.1E-08	1	--	6.0E-04	--	6.0E-04	--	--	0.000085	3.14%
Manganese	7439-96-5	1,250	0.001250	0.0010	0.51	N/A	1.0	0.21	0.0029	2.5E-06	--	1.3E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0014	51.50%
Mercury	7487-94-7	3.0	0.0000030	0.0010	8.4	N/A	1.0	3.5	0.0063	6.0E-09	--	3.2E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00015	5.65%
Nickel	7440-02-0	74.2	0.000074	0.00020	0.54	N/A	1.0	0.22	0.0006	3.0E-08	--	1.6E-08	0.04	--	2.0E-02	--	8.0E-04	--	--	0.000020	0.73%
Vanadium	7440-62-2	54.9	0.0001	0.0010	0.49	N/A	1.0	0.20	0.0027	1.1E-07	--	5.9E-08	0.03	--	5.0E-03	--	1.3E-04	--	--	0.000	16.57%
Zinc	7440-66-6	883	0.00088	0.00060	0.59	NA	1.0	0.24	0.0019	1.1E-06	--	5.7E-07	1	--	3.0E-01	--	3.0E-01	--	--	0.0000019	0.07%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	1E-09	100%	0.003	100%
Chromium [18]																					
Chromium (III)	16065-83-1	50.8	0.000051	0.0010	0.49	N/A	1.0	0.21	0.0028	1.0E-07	--	5.5E-08	0.01	--	1.5E+00	--	2.0E-02	--	--	0.0000028	0.10% [19]
Chromium (VI)	18540-29-9	50.8	0.000051	0.0020	0.4934691	N/A	1.0	0.21	0.0055	2.0E-07	3.9E-08	1.1E-07	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	7.8E-07	100% [20]	0.0015	34.89% [21]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	1E-09	--	0.003	--
																	Pathway Sums (including Chromium (VI)):	8E-07	--	0.004	--

Table B.6.14
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(19) Percent increase in cumulative hazard due to chromium (III).

(20) Percent increase in cumulative risk due to chromium (VI).

(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.15
FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE RECREATIONAL USER	
COPC Concentration in Surface Water (C_W)	hemical-specific	mg/L
Age-adjusted Surface Water Ingestion Rate (IFW_{adj})	0.01	L-yr/kg-day
Surface Water Ingestion Rate, child (IRW_c)	0.02	L/day
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	hemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	hemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (μg/L) (4)	Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds														
1,2-Dichloroethane	107-06-2	10 U	NC	NC	NC	NC	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives														
RDX	121-82-4	2	0.0020	2.4E-08	1.8E-07	3.3E-08	1.1E-01	3.0E-03	2.7E-09	6%	0.00006	0.22%	0.000	0.2%
Metals														
Aluminum	7429-90-5	37,500	37.5000	--	3.3E-03	6.2E-04	--	1.0E+00	--	--	0.0033	12%	0.001	12.3%
Arsenic	7440-38-2	2.3 J	0.0023	2.8E-08	2.0E-07	3.8E-08	1.5E+00	3.0E-04	4.2E-08	94%	0.00067	2.51%	0.000	2.5%
Barium	7440-39-3	439	0.4390	--	3.8E-05	7.2E-06	--	2.0E-01	--	--	0.00019	0.72%	0.000	0.7%
Cadmium	7440-43-9	11.2	0.0112	--	9.8E-07	1.8E-07	--	5.0E-04	--	--	0.0020	7.33%	0.000	7.3%
Cobalt	7440-48-4	18.2	0.0182	--	1.6E-06	3.0E-07	--	3.0E-04	--	--	0.0053	20%	0.001	19.9%
Copper	7440-50-8	612	0.6120	--	5.4E-05	1.0E-05	--	4.0E-02	--	--	0.0013	5.01%	0.000	5.0%
Cyanide	57-12-5	47.7	0.0477	--	4.2E-06	7.8E-07	--	6.0E-04	--	--	0.0070	26%	0.001	26.0%
Manganese	7439-96-5	1,250	1.2500	--	1.1E-04	2.1E-05	--	2.4E-02	--	--	0.0046	17.04%	0.001	17.0%
Mercury	7487-94-7	3.0	0.0030	--	2.6E-07	4.9E-08	--	3.0E-04	--	--	0.00088	3.27%	0.000	3.3%
Nickel	7440-02-0	74.2	0.0742	--	6.5E-06	1.2E-06		2.0E-02	--	--	0.00033	1.21%	0.000	1.2%
Vanadium	7440-62-2	54.9	0.0549	--	4.8E-06	9.0E-07	--	5.0E-03	--	--	0.00	4%	0.000	3.6%
Zinc	7440-66-6	883	0.8830	--	7.7E-05	1.5E-05	--	3.0E-01	--	--	0.00026	0.96%	0.000	1.0%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	4E-08	100%	3E-02	100%	5E-03	100%
Chromium (10)														
Chromium (III)	16065-83-1	50.8	0.0508	--	4.5E-06	8.4E-07	--	1.5E+00	--		0.0000030	0.0111% (11)	0.00000056	18.75000% (11)
Chromium (VI)	18540-29-9	50.8	0.0508	6.2E-07	4.5E-06	8.4E-07	5.0E-01	3.0E-03	3.1E-07	87% (12)	0.0015	5% (13)	0.00028	18.75000% (13)
								Pathway Sums (including Chromium(III)):	4E-08	--	0.03	--	0.005	--
								Pathway Sums (including Chromium (VI)):	4E-07	--	0.03	--	0.005	--

Table B.6.15

FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.16
FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	62,016	cm^2-yr/kg-day
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	2	hours/event
Event Duration (t_{event}) - adult	2	hours/event
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	2690	cm^2
Exposed Skin Surface Area, adult (SA_a)	6032	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days/year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days/year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days/year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD / RfD_d$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/cm^3) (5)	K_p (6) (cm/hour) (7)	t* (8) (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA (8) (unitless)	τ_{event} (8) (hour/event)	B (8) (unitless)	DA_{event} (mg/cm^2-event) (9)	Carcinogenic DAD (10) (mg/kg-day) (11)	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS (12) (unitless)	SFo (13) $(mg/kg\text{-}day)^{-1}$ (14)	RfDo (15) (mg/kg-day)	SF_d (16) $(mg/kg\text{-}day)^{-1}$	RfD_d (17) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds																								
1,2-Dichloroethane	107-06-2	10 U	NC	0.0042	0.90	No	1.0	0.38	0.016	NC	--	--	--	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	--	--	--	--	--	--
Explosives																								
RDX	121-82-4	2	0.0000020	0.000336	4.4	Yes	1.0	1.8	0.0019	3.6E-09	8.7E-09	4.2E-08	1.8E-08	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	9.5E-10	5%	0.000014	0.0235%	0.0000059	0.0235%
METALS																								
Aluminum	7429-90-5	37,500	0.038	0.0010	0.0010	N/A	1.0	1.0	0.15	7.5E-05	--	8.8E-04	3.7E-04	1	--	1.00E+00	--	1.0E+00	--	--	0.00088	1.483%	0.00037	1.483%
Arsenic	7440-38-2	2.3 J	0.0000023	0.0010	0.66	N/A	1.0	0.28	0.0033	4.6E-09	1.1E-08	5.4E-08	2.3E-08	1	1.50E+00	3.00E-04	1.5E+00	3.0E-04	1.7E-08	95%	0.00018	0.303%	0.00008	0.303%
Barium	7440-39-3	439	0.00044	0.0010	1.5	N/A	1.0	0.62	0.0045	8.8E-07	--	1.0E-05	4.4E-06	0.07	--	2.00E-01	--	1.4E-02	--	--	0.0007	1.24%	0.00031	1.24%
Cadmium	7440-43-9	11.2	0.000011	0.0010	1.1	N/A	1.0	0.45	0.0041	2.2E-08	--	2.6E-07	1.1E-07	0.05	--	5.00E-04	--	2.5E-05	--	--	0.011	17.7%	0.0044	17.7%
Cobalt	7440-48-4	18.2	0.000018	0.00040	0.54	N/A	1.0	0.22	0.0012	1.5E-08	--	1.7E-07	7.2E-08	1	--	3.00E-04	--	3.0E-04	--	--	0.00057	0.960%	0.00024	0.960%
Copper	7440-50-8	612	0.00061	0.0010	0.57	N/A	1.0	0.24	0.0031	1.2E-06	--	1.4E-05	6.1E-06	1	--	4.00E-02	--	4.0E-02	--	--	0.00036	0.605%	0.00015	0.605%
Cyanide	57-12-5	47.7	0.000048	0.0010	0.57	N/A	1.0	0.15	0.0020	9.5E-08	--	1.1E-06	4.7E-07	1	--	6.00E-04	--	6.0E-04	--	--	0.0019	3.14%	0.00079	3.14%
Manganese	7439-96-5	1,250	0.0013	0.0010	0.51	N/A	1.0	0.21	0.0029	2.5E-06	--	2.9E-05	1.2E-05	0.04	--	2.40E-02	--	9.6E-04	--	--	0.031	51.5%	0.013	51.5%
Mercury	7487-94-7	3.0	0.0000030	0.0010	8.4	N/A	1.0	3.5	0.0063	6.0E-09	--	7.1E-08	3.0E-08	0.07	--	3.00E-04	--	2.1E-05	--	--	0.003	5.65%	0.0014	5.65%
Nickel	7440-02-0	74.2	0.000074	0.00020	0.54	N/A	1.0	0.22	0.0006	3.0E-08	--	3.5E-07	1.5E-07	0.04	--	2.00E-02	--	8.0E-04	--	--	0.00044	0.734%	0.00018	0.734%
Vanadium	7440-62-2	54.9	0.0001	0.0010	0.49	N/A	1.0	0.20	0.0027	1.1E-07	--	1.3E-06	5.4E-07	0.026	--	5.04E-03	--	1.3E-04	--	--	0.0	17%	0.00	17%
Zinc	7440-66-6	883	0.00088	0.00060	0.59	NA	1.0	0.24	0.0019	1.1E-06	--	1.2E-05	5.3E-06	1	--	3.00E-01	--	3.0E-01	--	--	0.000042	0.0698%	0.000018	0.0698%
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums	1.8E-08	100%	0.1	100%	0.03	100%
Chromium (18)																								
Chromium (III)	16065-83-1	50.8	0.0000508	0.0010	0.49	N/A	1.0	0.21	0.0028	1.0E-07	--	1.2E-06	5.0E-07	0.013	--	1.5E+00	--	2.0E-02	--	--	0.000061	0.1029% (19)	0.000026	0.1029% (19)
Chromium (VI) (18)	18540-29-9	50.8	0.0000508	0.0020	0.4934691	N/A	1.0	0.21	0.0055	2.0E-07	4.9E-07	2.4E-06	1.0E-06	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	9.9E-06	100% (20)	0.032	35% (21)	0.013	35% (21)
																			Cancer Risk		**Hazard Index**		**Hazard Index**	
																		Pathway Sums (including Chromium(III)):	1.8E-08	--	0.1	--	0.03	--
																		Pathway Sums (including Chromium (VI)):	9.9E-06	--	0.1	--	0.04	--

Table B.6.16
FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Ditch Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.

(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(19) Percent increase in cumulative hazard due to chromium (III).
(20) Percent increase in cumulative risk due to chromium (VI).
(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.17
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER
Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
COPC Concentration in Surface Water (C_W)	hemical-specific	mg/L
Age-adjusted Surface Water Ingestion Rate (IFW_{adj})	0.013	L-yr/kg-day
Surface Water Ingestion Rate, child (IRW_c)	0.02	L/day
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	175	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	hemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	hemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day/year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day/year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day/year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)	Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds														
1,2-Dichloroethane	107-06-2	2 J	0.0020	1.8E-07	1.3E-06	2.4E-07	9.1E-02	6.0E-03	1.6E-08	71%	0.00021	0.897%	0.000040	0.897%
Explosives														
RDX	121-82-4	0.67	0.0007	6.0E-08	4.3E-07	8.0E-08	1.1E-01	3.0E-03	6.6E-09	29%	0.00014	0.601%	0.000027	0.601%
Metals														
Aluminum	7429-90-5	300	0.3000	--	1.9E-04	3.6E-05	--	1.0E+00	--	--	0.00019	0.807%	0.000036	0.807%
Arsenic	7440-38-2	3.6 U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	66.6 J	0.0666		4.3E-05	8.0E-06	--	2.0E-01			0.00021	0.896%	0.000040	0.896%
Cadmium	7440-43-9	0.45 J	0.0005	--	2.9E-07	5.4E-08	--	5.0E-04	--	--	0.00058	2.421%	0.000108	2.421%
Cobalt	7440-48-4	1.7 U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	19.7 U	NC	--	NC	NC	--	4.0E-02	--	--	--	--	--	--
Cyanide	57-12-5	14.9	0.0149		9.5E-06	1.8E-06	--	6.0E-04			0.01588	66.802%	0.002977	66.802%
Manganese	7439-96-5	236	0.2360	--	1.5E-04	2.8E-05	--	2.4E-02	--	--	0.00629	26.452%	0.001179	26.452%
Mercury	7487-94-7	0.11 J	0.0001	--	7.0E-08	1.3E-08	--	3.0E-04	--	--	0.00023	0.986%	0.000044	0.986%
Nickel	7440-02-0	35.2 U	NC		NC	NC		2.0E-02			--	--	--	--
Vanadium	7440-62-2	30.9 U	NC	--	NC	NC	--	5.0E-03	--	--	--	--	--	--
Zinc	7440-66-6	15.4 J	0.0154	--	9.8E-06	1.8E-06	--	3.0E-01	--	--	0.00003	0.138%	0.000006	0.138%
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums:	2E-08	100%	0.0238	100%	0.0045	100%
Chromium (10)														
Chromium (III)	16065-83-1	9.6 U	NC	--	NC	NC	--	1.5E+00	--	--	--	-- (11)	--	-- (11)
Chromium (VI)	18540-29-9	9.6 U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	-- (12)	--	-- (13)	--	-- (13)
									Cancer Risk		**Hazard Index**		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	2E-08	--	2E-02	--	4E-03	--
								Pathway Sums (including Chromium (VI)):	2E-08	--	2E-02	--	4E-03	--

Table B.6.17

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(11) Percent increase in cumulative hazard due to chromium (III).

(12) Percent increase in cumulative risk due to chromium (VI).

(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.18

HYPOTHETICAL FUTURE RESIDENT

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE RESIDENT	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	452,200	events-cm^2/kg
Exposure Frequency (EF)	175	days/yr
Event Duration (t_{event}) - child	2	hours/event
Event Duration (t_{event}) - adult	2	hours/event
Event Duration (t_{event}) (adjusted) [(t_{event} - child * ED_c)+(t_{event} - adult * ED_a) / 26 years]	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	2690	cm^2
Exposed Skin Surface Area, adult (SA_a)	6032	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	(mg/kg-day)$^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2\,FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [(1)]	CAS Number [(2)]	Exposure Point Concentration [(3)] (µg/L) [(4)]		Exposure Point Concentration (mg/cm^3) [(5)]	K_p [(6)] (cm/hour) [(7)]	t* [(8)] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [(8)] (unitless)	τ_{event} [(8)] (hour/event)	B [(8)] (unitless)	DA_{event} (mg/cm^2-event) [(9)]	Carcinogenic DAD [(10)] (mg/kg-day) [(11)]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [(12)] (unitless)	SFo [(13)] (mg/kg-day)$^{-1}$ [(14)]	RfDo [(15)] (mg/kg-day)	SF_d [(16)] (mg/kg-day)$^{-1}$	RfD_d [(17)] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds																									
1,2-Dichloroethane	107-06-2	2	J	0.0000020	0.0042	0.90	No	1	0.38	0.016	2.3E-08	4.1E-07	2.0E-06	8.3E-07	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	3.7E-08	94%	0.00033	0.6358%	0.00014	0.64%
Explosives																									
RDX	121-82-4	0.67		0.0000007	0.000336	4.4	Yes	1	1.8	0.0019	1.2E-09	2.1E-08	1.0E-07	4.3E-08	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	2.3E-09	6%	0.0000	0.0661%	0.000014	0.07%
METALS																									
Aluminum	7429-90-5	300		0.0003000	0.001	0.36	N/A	1	0.15	0.0020	6.00E-07	--	5.2E-05	2.2E-05	1	--	1.00E+00	--	1.0E+00	--	--	0.0001	0.100%	0.0000	0.10%
Arsenic	7440-38-2	3.6	U	NC	0.001	0.66	N/A	1	0.28	0.0033	NC	NC	NC	NC	1	1.50E+00	3.00E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	66.6	J	0.0000666	0.001	1.5	N/A	1	0.62	0.0045	1.33E-07	--	1.1E-05	4.8E-06	0.07	--	2.00E-01	--	1.4E-02	--	--	0.0008	1.58%	0.0003	1.58%
Cadmium	7440-43-9	0.45	J	0.0000005	0.001	1.1	N/A	1	0.45	0.0041	9.00E-10	--	7.7E-08	3.3E-08	0.05	--	5.00E-04	--	2.5E-05	--	--	0.003	6.0%	0.001	5.98%
Cobalt	7440-48-4	1.7	U	NC	0.0004	0.54	N/A	1	0.22	0.0012	NC	--	NC	NC	1	--	3.00E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	19.7	U	NC	0.001	0.57	N/A	1	0.24	0.0031	NC	--	NC	NC	1	--	4.00E-02	--	4.0E-02	--	--	--	--	--	--
Cyanide	57-12-5	14.9		0.0000149	0.001	0.35	N/A	1	0.15	0.0020	2.98E-08	--	2.6E-06	1.1E-06	1	--	6.00E-04	--	6.0E-04	--	--	0.004	8.25%	0.0018	8.25%
Manganese	7439-96-5	236		0.0002360	0.001	0.51	N/A	1	0.21	0.0029	4.72E-07	--	4.1E-05	1.7E-05	0.04	--	2.40E-02	--	9.6E-04	--	--	0.04	81.6%	0.018	81.64%
Mercury	7487-94-7	0.11	J	0.0000001	0.001	8.4	N/A	1	3.5	0.0063	2.20E-10	--	1.9E-08	8.0E-09	0.07	--	3.00E-04	--	2.1E-05	--	--	0.001	1.74%	0.000	1.74%
Nickel	7440-02-0	35.2	U	NC	0.0002	0.54	N/A	1	0.22	0.00059	NC	--	NC	NC	0.04	--	2.00E-02	--	8.0E-04	--	--	--	--	--	--
Vanadium	7440-62-2	30.9	U	NC	0.001	0.49	N/A	1	0.20	0.0027	NC	--	NC	NC	0.026	--	5.04E-03	--	1.3E-04	--	--	--	--	--	--
Zinc	7440-66-6	15.4	J	0.0000154	0.0006	0.59	N/A	1	0.24	0.0019	1.85E-08	--	1.6E-06	6.7E-07	1	--	3.00E-01	--	3.0E-01	--	--	0.00001	0.0102%	0.00000	0.01%
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	3.9E-08	100%	0.1	100%	0.0	100%
Chromium [(18)]																									
Chromium (III)	16065-83-1	9.6	U	NC	0.001	0.49	N/A	1	0.21	0.0028	NC	--	NC	NC	0.013	--	1.5E+00	--	2.0E-02	--	--	--	--		
Chromium (VI)	18540-29-9	9.6	U	NC	0.002	0.49	N/A	1	0.21	0.01	NC	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	--	--	--		
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	3.9E-08		0.1		0.0	
																			Pathway Sums (including Chromium (VI)):	3.9E-08		0.1		0.0	

Table B.6.18
HYPOTHETICAL FUTURE RESIDENT
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o /
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.19

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
COPC Concentration in Surface Water (C_W)	chemical-specific	mg/L
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	30	days/yr
Exposure Duration (ED)	1	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day/year)}$$

Carcinogenic: $Risk = Intake \times SF_o$

Noncarcinogenic: $HQ = Intake / RfD_o$

COPC (1)	CAS Number (2)	Exposure Point Concentration (3) (µg/L) (4)		Exposure Point Concentration (mg/L) (5)	Carcinogenic Intake (mg/kg-day) (6)	Noncarcinogenic Intake (mg/kg-day)	SF_o (7) $(mg/kg\text{-}day)^{-1}$ (8)	RfD_o (9) (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds												
1,2-Dichloroethane	107-06-2	2	J	0.0020	9.6E-08	4.1E-08	9.1E-02	6.0E-03	8.7E-09	71%	0.0000068	0.9%
Explosives												
RDX	121-82-4	0.67		0.0007	3.2E-08	1.4E-08	1.1E-01	3.0E-03	3.5E-09	29%	0.000005	0.6%
Metals												
Aluminum	7429-90-5	300		0.3000	--	6.2E-06	--	1.0E+00	--	--	0.00001	0.8%
Arsenic	7440-38-2	3.6	U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	66.6	J	0.0666	--	1.4E-06		2.0E-01			0.00001	0.9%
Cadmium	7440-43-9	0.45	J	0.0005	--	9.2E-09	--	5.0E-04	--	--	0.00002	2.4%
Cobalt	7440-48-4	1.7	U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	19.7	U	NC	--	NC	--	4.0E-02	--	--	--	--
Cyanide	57-12-5	14.9		0.0149	--	3.1E-07		6.0E-04			0.00051	66.8%
Manganese	7439-96-5	236		0.2360	--	4.8E-06	--	2.4E-02	--	--	0.0002	26.5%
Mercury	7487-94-7	0.11	J	0.0001	--	2.3E-09	--	3.0E-04	--	--	0.00001	1.0%
Nickel	7440-02-0	35.2	U	NC	--	NC		2.0E-02			--	--
Vanadium	7440-62-2	30.9	U	NC	--	NC	--	5.0E-03	--	--	--	--
Zinc	7440-66-6	15.4	J	0.0154	--	3.2E-07	--	3.0E-01	--	--	0.000001	0.1%
									Cancer Risk		**Hazard Index**	
								Pathway Sums:	1E-08	100%	0.001	100%
Chromium (10)												
Chromium (III)	16065-83-1	9.6	U	NC	--	NC	--	1.5E+00	--	--	--	-- (11)
Chromium (VI)	18540-29-9	9.6	U	NC	NC	NC	5.0E-01	3.0E-03	--	-- (12)	--	-- (13)
									Cancer Risk		**Hazard Index**	
								Pathway Sums (including Chromium(III)):	1E-08	--	0.001	
								Pathway Sums (including Chromium (VI)):	1E-08	--	0.001	

Table B.6.19

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.20

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	HETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	30	days/yr
Event Duration (t_{event})	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	1	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \leq t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \leq t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds																					
1,2-Dichloroethane	107-06-2	2 J	0.0000020	0.0042	0.90	No	1.0	0.38	0.016	2.3E-08	1.2E-09	8.2E-08	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	1.1E-10	94%	0.000014	0.5012%
Explosives																					
RDX	121-82-4	0.67	0.0000007	0.000336	4.4	Yes	1.0	1.8	0.0019	1.2E-09	6.1E-11	4.3E-09	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	6.7E-12	5.9%	0.000001	0.0522%
Metals																					
Aluminum	7429-90-5	300	0.000	0.0010	0.0010	N/A	1.0	1.0	0.15	1.2E-06	--	4.3E-06	1	--	1.0E+00	--	1.0E+00	--	--	0.00000	0.16%
Arsenic	7440-38-2	3.6 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	NC	NC	1	1.50E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	66.6 J	0.00007	0.0010	1.5	N/A	1.0	0.62	0.0045	2.2E-07	--	7.7E-07	0.07	--	2.0E-01	--	1.4E-02	--	--	0.00005	2.014%
Cadmium	7440-43-9	0.45 J	0.000000	0.0010	1.1	N/A	1.0	0.45	0.0041	1.3E-09	--	4.6E-09	0.05	--	5.0E-04	--	2.5E-05	--	--	0.0002	6.8%
Cobalt	7440-48-4	1.7 U	NC	0.00040	0.54	N/A	1.0	0.22	0.0012	NC	--	NC	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	19.7 U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	--	NC	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Cyanide	57-12-5	14.9	0.000015	0.0010	0.57	N/A	1.0	0.15	0.0020	3.4E-08	--	1.2E-07	1	--	6.0E-04	--	6.0E-04	--	--	0.00020	7.45%
Manganese	7439-96-5	236	0.0002	0.0010	0.51	N/A	1.0	0.21	0.0029	5.7E-07	--	2.0E-06	0.04	--	2.4E-02	--	9.6E-04	--	--	0.002	78.0%
Mercury	7487-94-7	0.11 J	0.0000001	0.0010	8.4	N/A	1.0	3.5	0.0063	8.0E-10	--	2.9E-09	0.07	--	3.0E-04	--	2.1E-05	--	--	0.0001	5.0%
Nickel	7440-02-0	35.2 U	NC	0.00020	0.54	N/A	1.0	0.22	0.0006	NC	--	NC	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Vanadium	7440-62-2	30.9 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	NC	0.03	--	5.0E-03	--	1.3E-04	--	--	--	--
Zinc	7440-66-6	15.4 J	0.00002	0.00060	0.59	NA	1.0	0.24	0.0019	2.3E-08	--	8.2E-08	1	--	3.0E-01	--	3.0E-01	--	--	0.000000	0.0100%
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	1E-10	100%	0.00	100%
Chromium [18]																					
Chromium (III)	16065-83-1	9.6 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	NC	0.01	--	1.5E+00	--	2.0E-02	--	--	--	-- [19]
Chromium (VI)	18540-29-9	9.6 U	NC	0.0020	0.49	N/A	1.0	0.21	0.0055	NC	NC	NC	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	-- [20]	--	-- [21]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	1E-10		0.00	
																	Pathway Sums (including Chromium (VI)):	1E-10		0.00	

Table B.6.20

HYPOTHETICAL FUTURE EXCAVATION/CONSTRUCTION WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(19) Percent increase in cumulative hazard due to chromium (III).

(20) Percent increase in cumulative risk due to chromium (VI).

(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.21

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
COPC Concentration in Surface Water (C_W)	chemical-specific	mg/L
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	113	days/yr
Exposure Duration (ED)	25	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor (SF_o)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight (BW)	80	kg
Oral Reference Dose (RfD_o)	chemical-specific	mg/kg-day

Equations

$$Intake = \frac{(C_W)(IRW_a)(EF)(ED)}{(BW_a)(AT)(365\,day\,/\,year)}$$

Carcinogenic: $Risk = Intake \times SF_o$

Noncarcinogenic: $HQ = Intake / RfD_o$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds											
1,2-Dichloroethane	107-06-2	2 J	0.0020	5.5E-08	1.5E-07	9.1E-02	6.0E-03	5.0E-09	71%	0.000026	0.897%
Explosives											
RDX	121-82-4	0.67	0.0007	1.9E-08	5.2E-08	1.1E-01	3.0E-03	2.0E-09	29%	0.000017	0.601%
Metals											
Aluminum	7429-90-5	300	0	--	2.3E-05	--	1.0E+00	--	--	0.0000	0.8%
Arsenic	7440-38-2	3.6 U	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	66.6 J	0.07	--	5.2E-06	--	2.0E-01	--	--	0.00003	0.896%
Cadmium	7440-43-9	0.45 J	0.000	--	3.5E-08	--	5.0E-04	--	--	0.0001	2.4%
Cobalt	7440-48-4	1.7 U	NC	--	NC	--	3.0E-04	--	--	--	--
Copper	7440-50-8	19.7 U	NC	--	NC	--	4.0E-02	--	--	--	--
Cyanide	57-12-5	14.9	0.015	--	1.2E-06	--	6.0E-04	--	--	0.0019	66.8%
Manganese	7439-96-5	236	0.2	--	1.8E-05	--	2.4E-02			0.0008	26.5%
Mercury	7487-94-7	0.11 J	0.0001	--	8.5E-09	--	3.0E-04	--	--	0.00003	1.0%
Nickel	7440-02-0	35.2 U	NC	--	NC	--	2.0E-02	--	--	--	--
Vanadium	7440-62-2	30.9 U	NC	--	NC	--	5.0E-03			--	--
Zinc	7440-66-6	15.4 J	0.02	--	1.2E-06	--	3.0E-01	--	--	0.00000	0.14%
								Cancer Risk		**Hazard Index**	
							Pathway Sums:	7E-09	100%	0.00	100%
Chromium [10]											
Chromium (III)	16065-83-1	9.6 U	NC	--	NC	--	1.5E+00	--	--	--	-- [11]
Chromium (VI)	18540-29-9	9.6 U	NC	NC	NC	5.0E-01	3.0E-03	--	-- [12]	--	-- [13]
								Cancer Risk		**Hazard Index**	
							Pathway Sums (including Chromium(III)):	7E-09	--	0.00	--
							Pathway Sums (including Chromium (VI)):	7E-09	--	0.00	--

Table B.6.21

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INCIDENTAL INGESTION OF SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.22

FUTURE PARK WORKER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE PARK WORKER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Exposure Frequency (EF)	113	days/yr
Event Duration (t_{event})	2	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Exposure Duration, adult (ED_a)	1	yrs
Exposed Skin Surface Area, adult (SA_a)	3470	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{NC})	25	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d) (calculated as Sfo/GIABS)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs}) (calculated as RfDo x GIABS)	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

$$DAD = \frac{(DA_{event})(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)(AT)(365\ days\ /\ year)}$$

for inorganic compounds:

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

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic:

$$Risk = DAD \times SF_d$$

Noncarcinogenic:

$$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]	Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient	% of Total
Volatile Organic Compounds																					
1,2-Dichloroethane	107-06-2	2 J	0.0000020	0.0042	0.90	No	1.0	0.38	0.016	2.3E-08	4.4E-09	1.2E-08	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	4.0E-10	94%	0.0000021	0.64%
Explosives																					
RDX	121-82-4	0.67	0.0000007	0.000336	4.4	Yes	1.0	1.8	0.0019	1.2E-09	2.3E-10	6.4E-10	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	2.5E-11	6%	0.00000021	0.07%
Metals																					
Aluminum	7429-90-5	300	0.000	0.0010	0.0010	N/A	1.0	1.0	0.15	6.0E-07	--	3.2E-07	1	--	1.0E+00	--	1.0E+00	--	--	0.000000	0.10%
Arsenic	7440-38-2	3.6 U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	--	--	1	1.50E+00	3.0E-04	1.5E+00	3.0E-04	--	--	--	--
Barium	7440-39-3	66.6 J	0.00007	0.0010	1.5	N/A	1.0	0.62	0.0045	1.3E-07	--	7.2E-08	0.07	--	2.0E-01	--	1.4E-02	--	--	0.000005	1.58%
Cadmium	7440-43-9	0.45 J	0.000000	0.0010	1.1	N/A	1.0	0.45	0.0041	9.0E-10	--	4.8E-10	0.05	--	5.0E-04	--	2.5E-05	--	--	0.00002	5.98%
Cobalt	7440-48-4	1.7 U	NC	0.00040	0.54	N/A	1.0	0.22	0.0012	NC	--	--	1	--	3.0E-04	--	3.0E-04	--	--	--	--
Copper	7440-50-8	19.7 U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	--	--	1	--	4.0E-02	--	4.0E-02	--	--	--	--
Cyanide	57-12-5	14.9	0.000015	0.0010	0.57	N/A	1.0	0.15	0.0020	3.0E-08	--	1.6E-08	1	--	6.0E-04	--	6.0E-04	--	--	0.000027	8.25%
Manganese	7439-96-5	236	0.000236	0.0010	0.51	N/A	1.0	0.21	0.0029	4.7E-07	--	2.5E-07	0.04	--	2.4E-02	--	9.6E-04	--	--	0.0003	81.64%
Mercury	7487-94-7	0.11 J	0.0000001	0.0010	8.4	N/A	1.0	3.5	0.0063	2.2E-10	--	1.2E-10	0.07	--	3.0E-04	--	2.1E-05	--	--	0.00001	1.74%
Nickel	7440-02-0	35.2 U	NC	0.00020	0.54	N/A	1.0	0.22	0.0006	NC	--	--	0.04	--	2.0E-02	--	8.0E-04	--	--	--	--
Vanadium	7440-62-2	30.9 U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	--	0.03	--	5.0E-03	--	1.3E-04	--	--	--	--
Zinc	7440-66-6	15.4 J	0.00002	0.00060	0.59	NA	1.0	0.24	0.0019	1.8E-08	--	9.9E-09	1	--	3.0E-01	--	3.0E-01	--	--	0.0000000	--
																		Cancer Risk		**Hazard Index**	
																	Pathway sums:	4E-10	100%	0.000	100%
Chromium [18]																					
Chromium (III)	16065-83-1	9.6 U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	--	0.01	--	1.5E+00	--	2.0E-02	--	--	--	-- [19]
Chromium (VI)	18540-29-9	9.6 U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	--	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	-- [20]	--	-- [21]
																		Cancer Risk		**Hazard Index**	
																	Pathway Sums (including Chromium(III)):	4E-10	--	0.000	--
																	Pathway Sums (including Chromium (VI)):	4E-10	--	0.000	--

Table B.6.22
FUTURE PARK WORKER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER
Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area
Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Exhibit A-6 and Appendix B (EPA, 2004).
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional Screening Level Calculator (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-
(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.
(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.

(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).

(19) Percent increase in cumulative hazard due to chromium (III).

(20) Percent increase in cumulative risk due to chromium (VI).

(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.23
FUTURE RECREATIONAL USER
CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER
Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area
Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE RECREATIONAL USER	
COPC Concentration in Surface Water (C_W)	hemical-specific	mg/L
Age-adjusted Surface Water Ingestion Rate (IFW_{adj})	0.01	L-yr/kg-day
Surface Water Ingestion Rate, child (IRW_c)	0.02	L/day
Surface Water Ingestion Rate, adult (IRW_a)	0.02	L/day
Exposure Frequency (EF)	24	days/yr
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor (SF_o)	hemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose (RfD_o)	hemical-specific	mg/kg-day

Equations

For carcinogenic the intake is calculated as:

$$Intake = \frac{(C_W)(IFW_{adj})(EF)}{(AT)(365\ day\ /\ year)}$$

where: $$IFW_{adj} = \frac{(ED_c)(IRW_c)}{(BW_c)} + \frac{(ED_a)(IRW_a)}{(BW_a)}$$

For noncarcinogenic the intake is calculated as:

$$Intake_{child} = \frac{(C_W)(ED_c)(IRW_c)(EF)}{(BW_c)(AT_{chid})(365 day / year)}$$

$$Intake_{adult} = \frac{(C_W)(ED_a)(IRW_a)(EF)}{(BW_a)(AT_{adult})(365 day / year)}$$

Carcinogenic: $$Risk = Intake \times SF_o$$

Noncarcinogenic: $$HQ = Intake / RfD_o$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/L) [5]	Carcinogenic Intake (mg/kg-day) [6]	Noncarcinogenic Intake - Child (mg/kg-day)	Noncarcinogenic Intake - Adult (mg/kg-day)	SF_o [7] $(mg/kg\text{-}day)^{-1}$ [8]	RfD_o [9] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds															
1,2-Dichloroethane	107-06-2	2	J	0.0020	2.4E-08	1.8E-07	3.3E-08	9.1E-02	6.0E-03	2.2E-09	71%	0.000029	0.90%	0.000	0.9%
Explosives															
RDX	121-82-4	0.67		0.0007	8.2E-09	5.9E-08	1.1E-08	1.1E-01	3.0E-03	9.0E-10	29%	0.00002	0.60%	0.000	0.6%
Metals															
Aluminum	7429-90-5	300		0.3000	--	2.6E-05	4.9E-06	--	1.0E+00	--	--	0.0000	1%	0.000	0.8%
Arsenic	7440-38-2	3.6	U	NC	NC	NC	NC	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	66.6	J	0.0666	--	5.8E-06	1.1E-06	--	2.0E-01	--	--	0.00003	0.90%	0.000	0.9%
Cadmium	7440-43-9	0.45	J	0.0005	--	3.9E-08	7.4E-09	--	5.0E-04	--	--	0.0001	2.42%	0.000	2.4%
Cobalt	7440-48-4	1.7	U	NC	--	NC	NC	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	19.7	U	NC	--	NC	NC	--	4.0E-02	--	--	--	--	--	--
Cyanide	57-12-5	14.9		0.0149	--	1.3E-06	2.4E-07	--	6.0E-04	--	--	0.0022	67%	0.000	66.8%
Manganese	7439-96-5	236		0.2360	--	2.1E-05	3.9E-06	--	2.4E-02	--	--	0.0009	26.45%	0.000	26.5%
Mercury	7487-94-7	0.11	J	0.0001	--	9.6E-09	1.8E-09	--	3.0E-04	--	--	0.00003	0.99%	0.000	1.0%
Nickel	7440-02-0	35.2	U	NC	--	NC	NC		2.0E-02	--	--	--	--	--	--
Vanadium	7440-62-2	30.9	U	NC	--	NC	NC	--	5.0E-03	--	--	--	--	--	--
Zinc	7440-66-6	15.4	J	0.0154	--	1.4E-06	2.5E-07	--	3.0E-01	--	--	0.00000	0.14%	0.000	0.1%
										Cancer Risk		**Hazard Index**		**Hazard Index**	
									Pathway Sums:	3E-09	100%	3E-03	100%	6E-04	100%
Chromium [10]															
Chromium (III)	16065-83-1	9.6	U	NC	--	NC	NC	--	1.5E+00	--		--	-- [11]	--	-- [11]
Chromium (VI)	18540-29-9	9.6	U	NC	NC	NC	NC	5.0E-01	3.0E-03	--	-- [12]	--	-- [13]	--	-- [13]
									Pathway Sums (including Chromium(III)):	3E-09	--	0.00	--	0.001	--
									Pathway Sums (including Chromium (VI)):	3E-09	--	0.00	--	0.001	--

Table B.6.23

FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- INGESTION OF SURFACE WATER AS DRINKING WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) μg/L = microgram per liter.
(5) mg/L = milligram per liter.
(6) mg/kg-day = milligram per kilogram-day.
(7) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(8) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.
(9) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(10) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(11) Percent increase in cumulative hazard due to chromium (III).
(12) Percent increase in cumulative risk due to chromium (VI).
(13) Percent increase in cumulative hazard due to chromium (VI).
-- = toxicity data not available.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

Table B.6.24

FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

Exposure Assumptions		
Receptor	FUTURE RECREATIONAL USER	
Absorbed dose per event (DA_{event})	chemical-specific	mg/cm^2-event
Age-adjusted Dermal Factor (SFW_{adj})	62,016	cm^2-yr/kg-day
Exposure Frequency (EF)	24	days/yr
Event Duration (t_{event}) - child	2	hours/event
Event Duration (t_{event}) - adult	2	hours/event
Event Duration (t_{event})	2.0	hours/event
Time to Reach Steady-state (t*)	chemical-specific	hours
Event Frequency, adult (EV_a)	1	events/day
Event Frequency, child (Ev_c)	1	events/day
Exposure Duration, child (ED_c)	6	yrs
Exposure Duration, adult (ED_a)	20	yrs
Exposed Skin Surface Area, child (SA_c)	2690	cm^2
Exposed Skin Surface Area, adult (SA_a)	6032	cm^2
Permeability Coefficient (K_p)	chemical-specific	cm/hour
Averaging Time, Carcinogens (AT_C)	70	yrs
Averaging Time, Noncarcinogens (AT_{child})	6	yrs
Averaging Time, Noncarcinogens (AT_{adult})	20	yrs
Oral Slope Factor Adjusted for GI Absorption (SF_d)	chemical-specific	$(mg/kg\text{-}day)^{-1}$
Body Weight, child (BW_c)	15	kg
Body Weight, adult (BW_a)	80	kg
Oral Reference Dose Adjusted for GI Absorption (RfD_{abs})	chemical-specific	mg/kg-day
Oral Absorption Factor (OAF)	chemical-specific	unitless
Concentration in water (C_w)	chemical-specific	mg/cm^3
Fraction Absorbed Water (FA)	chemical-specific	unitless
Lag Time per Event (τ_{event})	chemical-specific	hr/event
Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis (B)	chemical-specific	unitless

Equations

For carcinogenic analytes the intake is calculated as:

$$DAD = \frac{(DA_{event})(SFW_{adj})}{(AT)(365\ days\ /\ year)}$$

where: $$SFW_{adj} = \frac{(EV_c)(ED_c)(EF)(SA_c)}{(BW_c)} + \frac{(EV_a)(ED_a)(EF)(SA_a)}{(BW_a)}$$

For noncarcinogenic analytes the intake is calculated as:

$$DAD_{child} = \frac{(DA_{event})(EV_c)(ED_c)(SA_c)(EF)}{(BW_c)(AT_{child})(365\,days\ /\ year)}$$

$$DAD_{adult} = \frac{(DA_{event})(EV_a)(ED_a)(SA_a)(EF)}{(BW_a)(AT_{adult})(365\,days\ /\ year)}$$

for inorganic compounds: $$DA_{event} = (K_p)(C_w)(t_{event})$$

for organic compounds:

If $t_{event} \le t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_w \sqrt{\frac{6\tau_{event} \times t_{event}}{\pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

Carcinogenic: $$Risk = DAD \times SF_d$$

Noncarcinogenic: $$HQ = DAD\ /\ RfD_d$$

COPC [1]	CAS Number [2]	Exposure Point Concentration [3] (µg/L) [4]		Exposure Point Concentration (mg/cm^3) [5]	K_p [6] (cm/hour) [7]	t* [8] (hours)	Is $t_{event} \le t^*$? (Yes/No)	FA [8] (unitless)	τ_{event} [8] (hour/event)	B [8] (unitless)	DA_{event} (mg/cm^2-event) [9]	Carcinogenic DAD [10] (mg/kg-day) [11]	Noncarcinogenic DAD - child (mg/kg-day)	Noncarcinogenic DAD - adult (mg/kg-day)	GIABS [12] (unitless)	SFo [13] $(mg/kg\text{-}day)^{-1}$ [14]	RfDo [15] (mg/kg-day)	SF_d [16] $(mg/kg\text{-}day)^{-1}$	RfD_d [17] (mg/kg-day)	Cancer Risk	% of Total	Hazard Quotient Child	% of Total	Hazard Quotient Adult	% of Total
Volatile Organic Compounds																									
1,2-Dichloroethane	107-06-2	2	J	0.0000020	0.0042	0.90	No	1.0	0.38	0.016	2.3E-08	5.6E-08	2.7E-07	1.1E-07	1	9.1E-02	6.0E-03	9.1E-02	6.0E-03	5.1E-09	94%	0.000045	0.6358%	0.000019	0.6358%
Explosives																									
RDX	121-82-4	0.67		0.0000007	0.000336	4.4	Yes	1.0	1.8	0.0019	1.2E-09	2.9E-09	1.4E-08	5.9E-09	1	1.1E-01	3.0E-03	1.1E-01	3.0E-03	3.2E-10	6%	0.000005	0.0661%	0.0000020	0.0661%
METALS																									
Aluminum	7429-90-5	300		0.000	0.0010	0.0010	N/A	1.0	1.0	0.15	6.0E-07	--	7.1E-06	3.0E-06	1	--	1.00E+00	--	1.0E+00	--	--	0.00001	0.100%	0.00000	0.100%
Arsenic	7440-38-2	3.6	U	NC	0.0010	0.66	N/A	1.0	0.28	0.0033	NC	--	--	--	1	1.50E+00	3.00E-04	1.5E+00	3.0E-04	--	--	--	--	--	--
Barium	7440-39-3	66.6	J	0.00007	0.0010	1.5	N/A	1.0	0.62	0.0045	1.3E-07	--	1.6E-06	6.6E-07	0.07	--	2.00E-01	--	1.4E-02	--	--	0.0001	1.58%	0.00005	1.58%
Cadmium	7440-43-9	0.45	J	0.000000	0.0010	1.1	N/A	1.0	0.45	0.0041	9.0E-10	--	1.1E-08	4.5E-09	0.05	--	5.00E-04	--	2.5E-05	--	--	0.000	6.0%	0.0002	6.0%
Cobalt	7440-48-4	1.7	U	NC	0.00040	0.54	N/A	1.0	0.22	0.0012	NC	--	--	--	1	--	3.00E-04	--	3.0E-04	--	--	--	--	--	--
Copper	7440-50-8	19.7	U	NC	0.0010	0.57	N/A	1.0	0.24	0.0031	NC	--	--	--	1	--	4.00E-02	--	4.0E-02	--	--	--	--	--	--
Cyanide	57-12-5	14.9		0.000015	0.0010	0.57	N/A	1.0	0.15	0.0020	3.0E-08	--	3.5E-07	1.5E-07	1	--	6.00E-04	--	6.0E-04	--	--	0.0006	8.25%	0.00025	8.25%
Manganese	7439-96-5	236		0.0002	0.0010	0.51	N/A	1.0	0.21	0.0029	4.7E-07	--	5.6E-06	2.3E-06	0.04	--	2.40E-02	--	9.6E-04	--	--	0.006	81.6%	0.002	81.6%
Mercury	7487-94-7	0.11	J	0.0000001	0.0010	8.4	N/A	1.0	3.5	0.0063	2.2E-10	--	2.6E-09	1.1E-09	0.07	--	3.00E-04	--	2.1E-05	--	--	0.000	1.74%	0.0001	1.74%
Nickel	7440-02-0	35.2	U	NC	0.00020	0.54	N/A	1.0	0.22	0.0006	NC	--	--	--	0.04	--	2.00E-02	--	8.0E-04	--	--	--	--	--	--
Vanadium	7440-62-2	30.9	U	NC	0.0010	0.49	N/A	1.0	0.20	0.0027	NC	--	--	--	0.026	--	5.04E-03	--	1.3E-04	--	--	--	--	--	--
Zinc	7440-66-6	15.4	J	0.00002	0.00060	0.59	NA	1.0	0.24	0.0019	1.8E-08	--	2.2E-07	9.2E-08	1	--	3.00E-01	--	3.0E-01	--	--	0.000001	0.0102%	0.000000	0.0102%
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums	5.4E-09	100%	0.0	100%	0.00	100%
Chromium [18]																									
Chromium (III)	16065-83-1	9.6	U	NC	0.0010	0.49	N/A	1.0	0.21	0.0028	NC	--	--	--	0.013	--	1.5E+00	--	2.0E-02	--	--	--	-- [19]	--	-- [19]
Chromium (VI) [18]	18540-29-9	9.6	U	NC	0.0020	0.4934691	N/A	1.0	0.21	0.0055	NC	--	--	--	0.025	5.0E-01	3.0E-03	2.0E+01	7.5E-05	--	-- [20]	--	-- [21]	--	-- [21]
																				Cancer Risk		**Hazard Index**		**Hazard Index**	
																			Pathway Sums (including Chromium(III)):	5.4E-09	--	0.0	--	0.00	--
																			Pathway Sums (including Chromium (VI)):	5.4E-09	--	0.0	--	0.00	--

Table B.6.24

FUTURE RECREATIONAL USER

CARCINOGENIC AND NONCARCINOGENIC RISK ESTIMATES -- DERMAL CONTACT WITH SURFACE WATER

Maximum Detected Concentration from 1991 through 1997 for Reeder Creek + Downstream Samples taken within Exposure Area

Seneca Army Depot Activity

(1) COPC = Constituent of potential concern.
(2) CAS = Chemical Abstracts Service number.
(3) Exposure point concentration is the maximum detected concentration. See Table 2.13.
(4) µg/L = microgram per liter.
(5) mg/cm^3 = milligram per cubic centimeter.
(6) K_p values obtained from USEPA Risk
(7) cm/hour = centimeter/hour.
(8) Values obtained from USEPA Regional
(9) mg/cm^2-event = milligram per squared centimeter per event.
(10) DAD = Dermally absorbed dose.
(11) mg/kg-day = milligram per kilogram-day.

(12) GIABS = Gastrointestinal absorbtion value. Values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(13) SFo is the oral cancer slope factor. SFo values obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).
(14) $(mg/kg\text{-}day)^{-1}$ = inverse of milligram per kilogram-day.

(15) RfDo is the oral reference dose. RfDo values were obtained from USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2014 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_run_MAY2014.pdf).

(16) SF_d is the dermal cancer slope factor, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). SF_d values were calculated as Sf_o / GIABS.

(17) RfD_d is the dermal reference dose, derived based on absorbed dose equations in Chapter 4 in USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004). RfD_d values were calculated as RfD_o x GIABS.
(18) Chromium can exist in environment as chromium(III) and chromium (VI). The cumulative risk/hazard estimates will be calculated with all analytes and either chromium(III) or chromium(VI).
(19) Percent increase in cumulative hazard due to chromium (III).
(20) Percent increase in cumulative risk due to chromium (VI).
(21) Percent increase in cumulative hazard due to chromium (VI).

-- = toxicity data not available.
N/A = Not applicable.
J = Analyte detected between MDL and practical quantitation limit (PQL).
U= Analyte not detected.
UJ= Analyte not detected, reported LOD may be innacurate or imprecise.

ATTACHMENT C

IEUBK SUPPORTING INFORMATION

Attachment C Contents

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 0.710 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

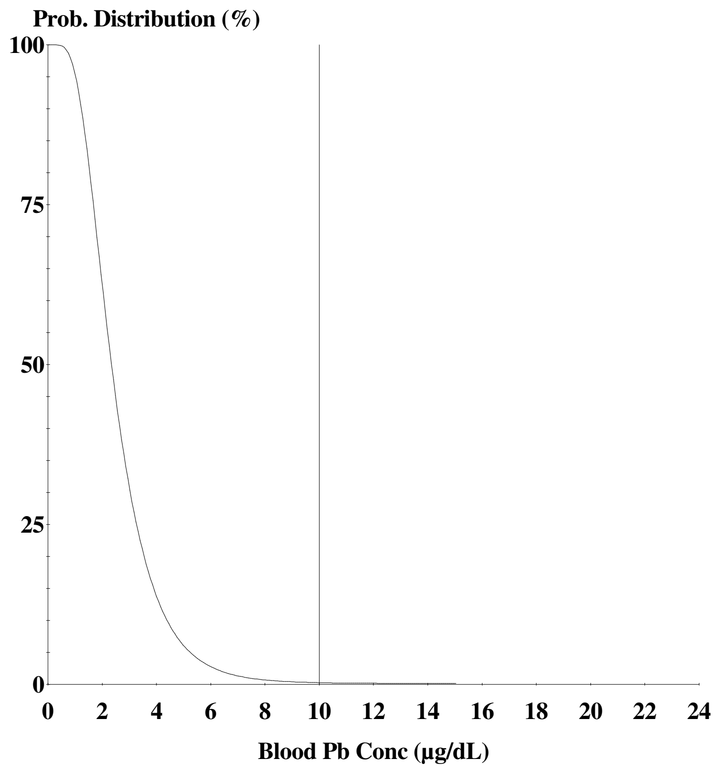
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.062	0.644	0.260
1-2	0.034	0.919	0.642	0.260
2-3	0.062	1.007	0.648	0.262
3-4	0.067	0.972	0.653	0.264
4-5	0.067	0.943	0.662	0.268
5-6	0.093	0.997	0.666	0.269
6-7	0.093	1.082	0.668	0.270

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.513	5.499	3.0
1-2	5.566	7.420	3.1
2-3	5.614	7.593	2.8
3-4	5.660	7.616	2.7
4-5	4.254	6.194	2.2
5-6	3.849	5.875	1.9
6-7	3.646	5.760	1.7



Cutoff = 10.000 µg/dl
Geo Mean = 2.459
GSD = 1.600
% Above = 0.142

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 0.660 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

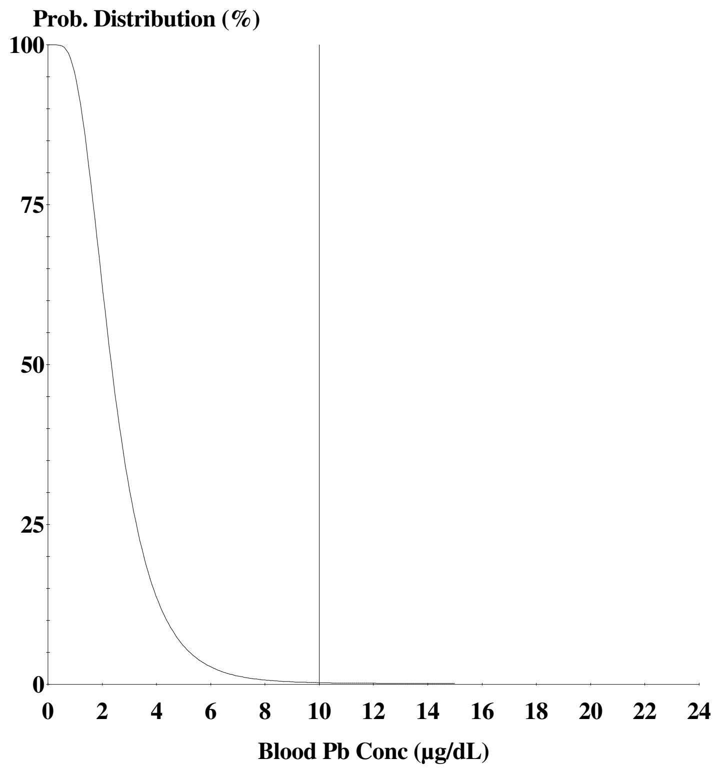
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.062	0.644	0.242
1-2	0.034	0.919	0.642	0.241
2-3	0.062	1.007	0.648	0.243
3-4	0.067	0.972	0.653	0.245
4-5	0.067	0.943	0.663	0.249
5-6	0.093	0.997	0.666	0.250
6-7	0.093	1.083	0.668	0.251

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.513	5.482	3.0
1-2	5.566	7.403	3.1
2-3	5.615	7.575	2.8
3-4	5.661	7.598	2.7
4-5	4.254	6.175	2.2
5-6	3.850	5.856	1.9
6-7	3.646	5.741	1.7



Cutoff = 10.000 µg/dl
Geo Mean = 2.453
GSD = 1.600
% Above = 0.139

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 0.730 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

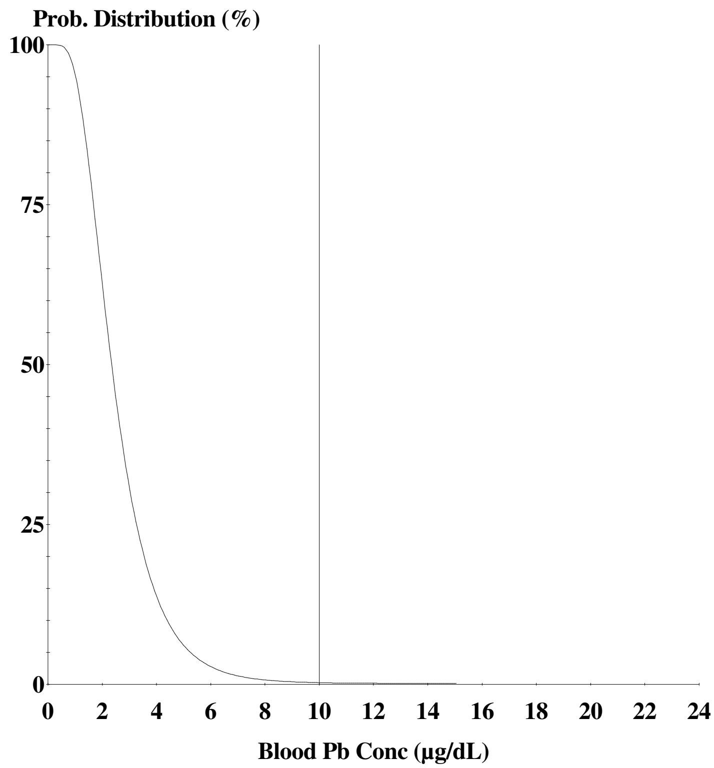
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.062	0.644	0.267
1-2	0.034	0.918	0.642	0.267
2-3	0.062	1.007	0.648	0.269
3-4	0.067	0.972	0.653	0.271
4-5	0.067	0.943	0.662	0.275
5-6	0.093	0.997	0.666	0.277
6-7	0.093	1.082	0.668	0.278

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.512	5.506	3.0
1-2	5.565	7.427	3.1
2-3	5.614	7.600	2.8
3-4	5.660	7.623	2.7
4-5	4.254	6.201	2.2
5-6	3.849	5.882	1.9
6-7	3.646	5.767	1.7



Cutoff = 10.000 µg/dl
Geo Mean = 2.462
GSD = 1.600
% Above = 0.143

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 15.700 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

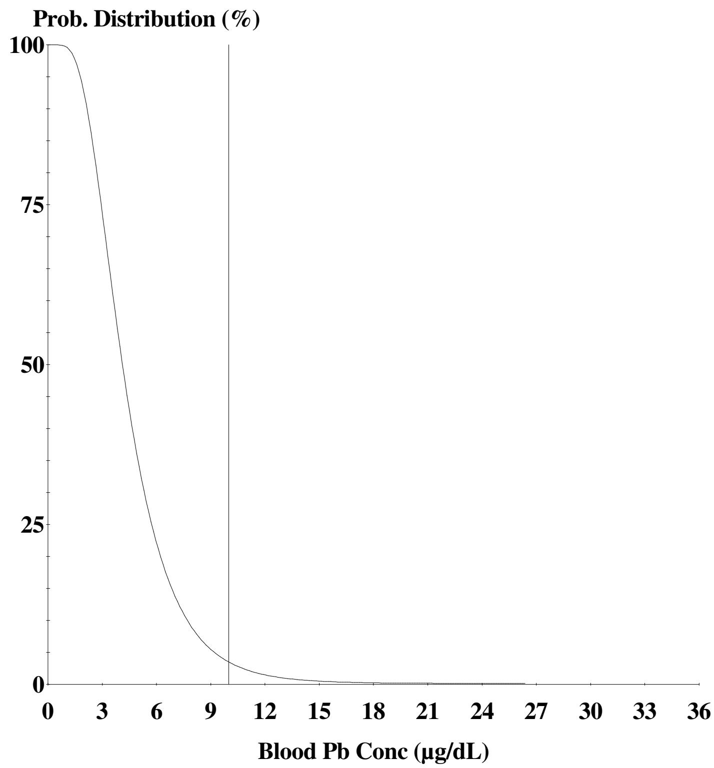
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.003	0.608	5.434
1-2	0.034	0.879	0.614	5.491
2-3	0.062	0.969	0.623	5.572
3-4	0.067	0.941	0.632	5.646
4-5	0.067	0.916	0.643	5.750
5-6	0.093	0.971	0.649	5.799
6-7	0.093	1.056	0.652	5.827

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.318	10.384	5.6
1-2	5.325	12.344	5.3
2-3	5.404	12.630	4.7
3-4	5.475	12.760	4.5
4-5	4.130	11.506	4.0
5-6	3.749	11.261	3.5
6-7	3.558	11.187	3.2



Cutoff = 10.000 µg/dl
Geo Mean = 4.315
GSD = 1.600
% Above = 3.686

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 1.100 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

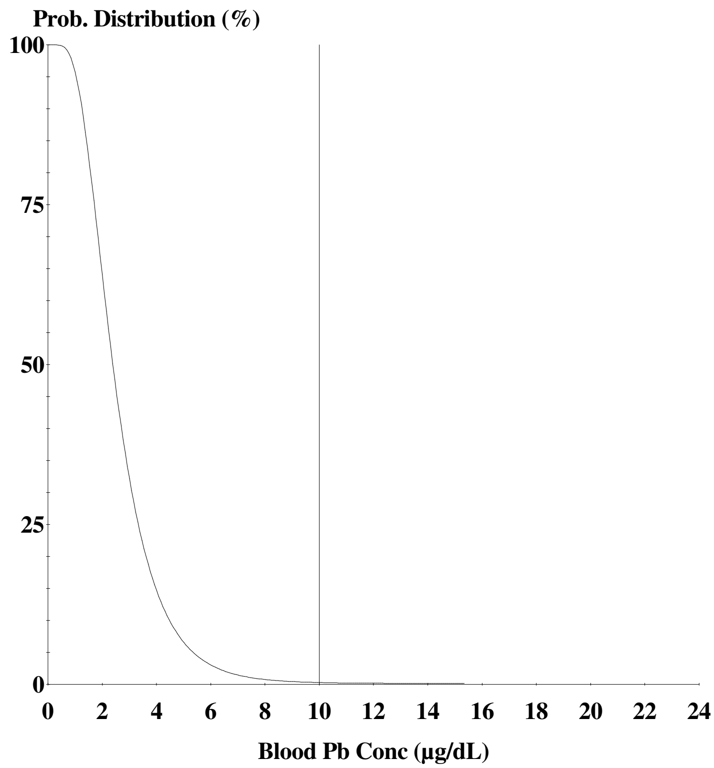
****

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.060	0.643	0.402
1-2	0.034	0.917	0.641	0.402
2-3	0.062	1.006	0.647	0.405
3-4	0.067	0.971	0.652	0.409
4-5	0.067	0.942	0.662	0.415
5-6	0.093	0.996	0.666	0.417
6-7	0.093	1.082	0.668	0.418

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.507	5.633	3.1
1-2	5.559	7.554	3.2
2-3	5.609	7.729	2.9
3-4	5.655	7.754	2.7
4-5	4.250	6.336	2.3
5-6	3.847	6.018	1.9
6-7	3.643	5.904	1.7



Cutoff = 10.000 µg/dl
Geo Mean = 2.510
GSD = 1.600
% Above = 0.163

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

******** Air ********

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******** Diet ********

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

******** Drinking Water ********

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 5.400 µg Pb/L

******** Soil & Dust ********

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

****** Maternal Contribution: Infant Model ******

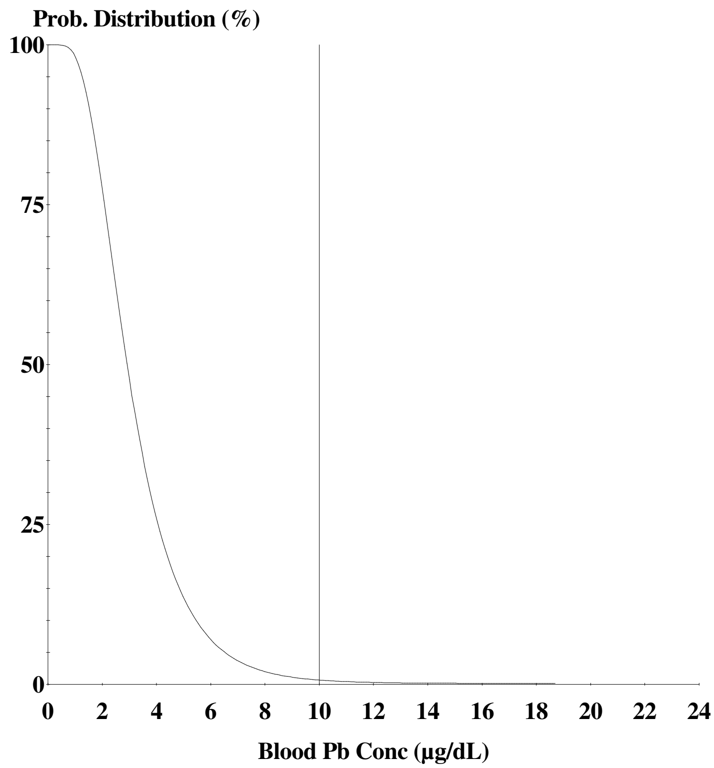
Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.042	0.632	1.943
1-2	0.034	0.906	0.633	1.946
2-3	0.062	0.995	0.640	1.967
3-4	0.067	0.962	0.646	1.986
4-5	0.067	0.934	0.656	2.018
5-6	0.093	0.988	0.661	2.031
6-7	0.093	1.074	0.663	2.038

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.449	7.086	3.8
1-2	5.487	9.007	3.8
2-3	5.546	9.210	3.4
3-4	5.601	9.262	3.3
4-5	4.214	7.889	2.8
5-6	3.817	7.590	2.4
6-7	3.618	7.486	2.2

C.1.12 MW23-4 Distribution Probability Percent



Cutoff = 10.000 µg/dl
Geo Mean = 3.058
GSD = 1.600
% Above = 0.585

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 2.400 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

****** Maternal Contribution: Infant Model ******

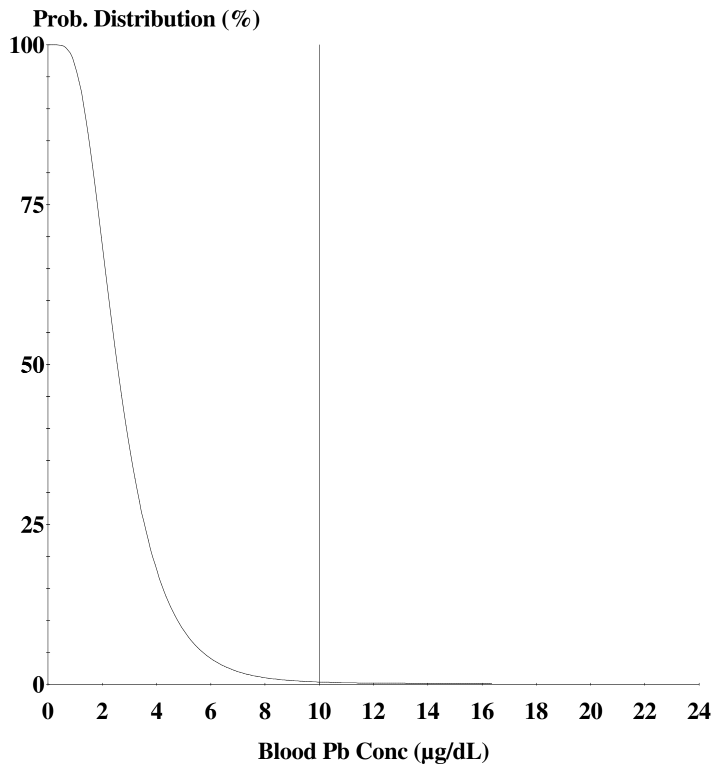
Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.055	0.639	0.874
1-2	0.034	0.914	0.639	0.873
2-3	0.062	1.003	0.645	0.881
3-4	0.067	0.969	0.650	0.889
4-5	0.067	0.940	0.660	0.902
5-6	0.093	0.994	0.664	0.907
6-7	0.093	1.079	0.666	0.910

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.489	6.078	3.3
1-2	5.537	7.997	3.4
2-3	5.590	8.180	3.1
3-4	5.638	8.213	2.9
4-5	4.239	6.808	2.4
5-6	3.838	6.496	2.1
6-7	3.636	6.385	1.8

C.1.14 MW23-5 Distribution Probability Percent



Cutoff = 10.000 µg/dl
Geo Mean = 2.677
GSD = 1.600
% Above = 0.252

Age Range = 0 to 84 months

Run Mode = Research

C.1.15 MW23-6 IEUBK Output

LEAD MODEL FOR WINDOWS Version 1.1

==

Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==

******** Air ********

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******** Diet ********

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

******** Drinking Water ********

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 3.600 µg Pb/L

******** Soil & Dust ********

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

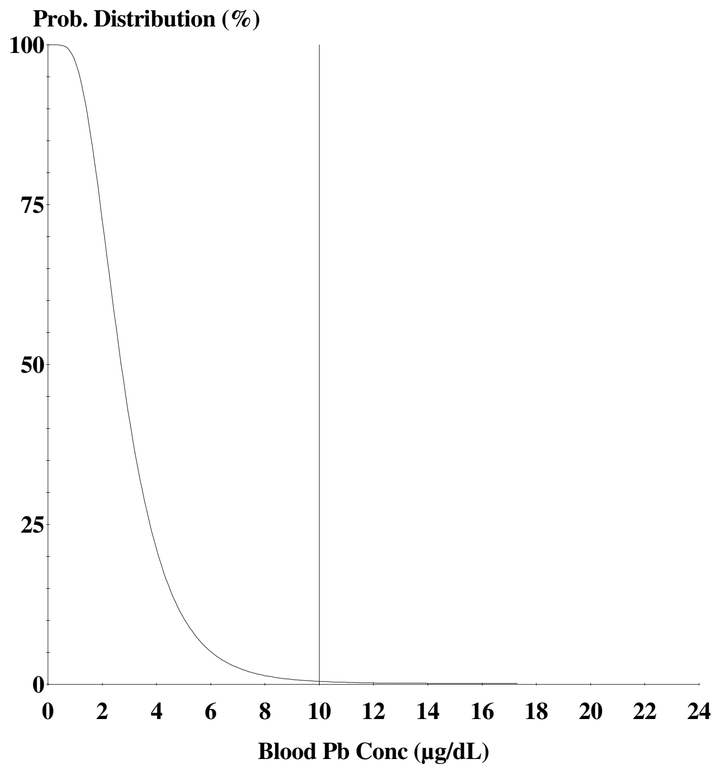
****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.050	0.636	1.304
1-2	0.034	0.911	0.636	1.304
2-3	0.062	0.999	0.643	1.318
3-4	0.067	0.966	0.649	1.330
4-5	0.067	0.937	0.659	1.350
5-6	0.093	0.992	0.663	1.358
6-7	0.093	1.077	0.665	1.363

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.473	6.484	3.5
1-2	5.517	8.403	3.6
2-3	5.572	8.594	3.2
3-4	5.623	8.634	3.0
4-5	4.229	7.242	2.6
5-6	3.829	6.935	2.2
6-7	3.628	6.826	2.0



Cutoff = 10.000 µg/dl
Geo Mean = 2.830
GSD = 1.600
% Above = 0.362

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

******** Air ********

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******** Diet ********

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

******** Drinking Water ********

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 0.710 µg Pb/L

******** Soil & Dust ********

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****

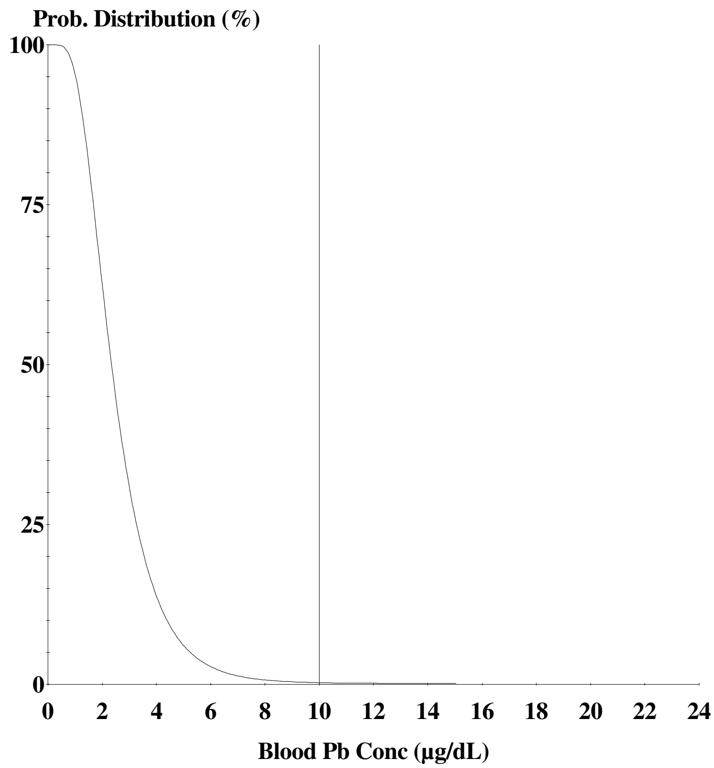
CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.062	0.644	0.260
1-2	0.034	0.919	0.642	0.260
2-3	0.062	1.007	0.648	0.262
3-4	0.067	0.972	0.653	0.264
4-5	0.067	0.943	0.662	0.268
5-6	0.093	0.997	0.666	0.269
6-7	0.093	1.082	0.668	0.270

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.513	5.499	3.0
1-2	5.566	7.420	3.1
2-3	5.614	7.593	2.8
3-4	5.660	7.616	2.7
4-5	4.254	6.194	2.2
5-6	3.849	5.875	1.9
6-7	3.646	5.760	1.7

C.1.18 MW45-2 Distribution Probability Percent



Cutoff = 10.000 µg/dl
Geo Mean = 2.459
GSD = 1.600
% Above = 0.142

Age Range = 0 to 84 months

Run Mode = Research

C.1.19 MW45-3 IEUBK Output

LEAD MODEL FOR WINDOWS Version 1.1

==

Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==

******** Air ********

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******** Diet ********

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

******** Drinking Water ********

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 9.500 µg Pb/L

******** Soil & Dust ********

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

****** Maternal Contribution: Infant Model ******

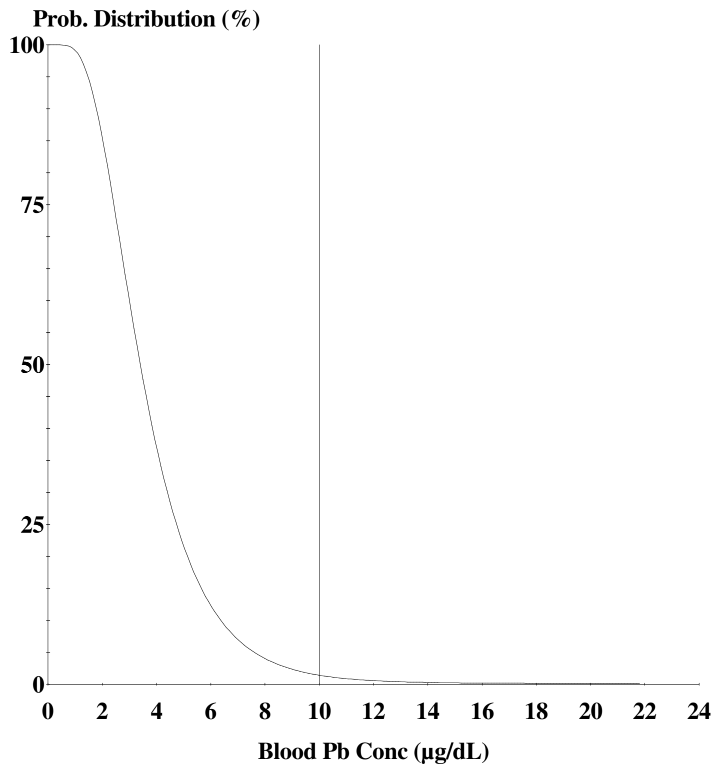
Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.026	0.622	3.364
1-2	0.034	0.895	0.625	3.383
2-3	0.062	0.984	0.633	3.424
3-4	0.067	0.953	0.640	3.463
4-5	0.067	0.927	0.651	3.521
5-6	0.093	0.981	0.656	3.547
6-7	0.093	1.067	0.658	3.561

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	3.395	8.429	4.5
1-2	5.421	10.358	4.4
2-3	5.488	10.592	4.0
3-4	5.550	10.673	3.7
4-5	4.180	9.346	3.2
5-6	3.790	9.067	2.9
6-7	3.594	8.974	2.6

C.1.20 MW45-3 Distribution Probability Percent



Cutoff = 10.000 µg/dl
Geo Mean = 3.568
GSD = 1.600
% Above = 1.416

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

******** Air ********

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******** Diet ********

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

******** Drinking Water ********

Water Consumption:

Age	Water (L/day)
.5-1	0.780
1-2	0.780
2-3	0.780
3-4	0.780
4-5	0.780
5-6	0.780
6-7	0.780

Drinking Water Concentration: 75.600 µg Pb/L

******** Soil & Dust ********

Multiple Source Analysis Used
Average multiple source concentration: 128.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	169.000	128.300
1-2	169.000	128.300
2-3	169.000	128.300
3-4	169.000	128.300
4-5	169.000	128.300
5-6	169.000	128.300
6-7	169.000	128.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	1.370
1-2	1.370
2-3	1.370
3-4	1.370
4-5	1.370
5-6	1.370
6-7	1.370

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****

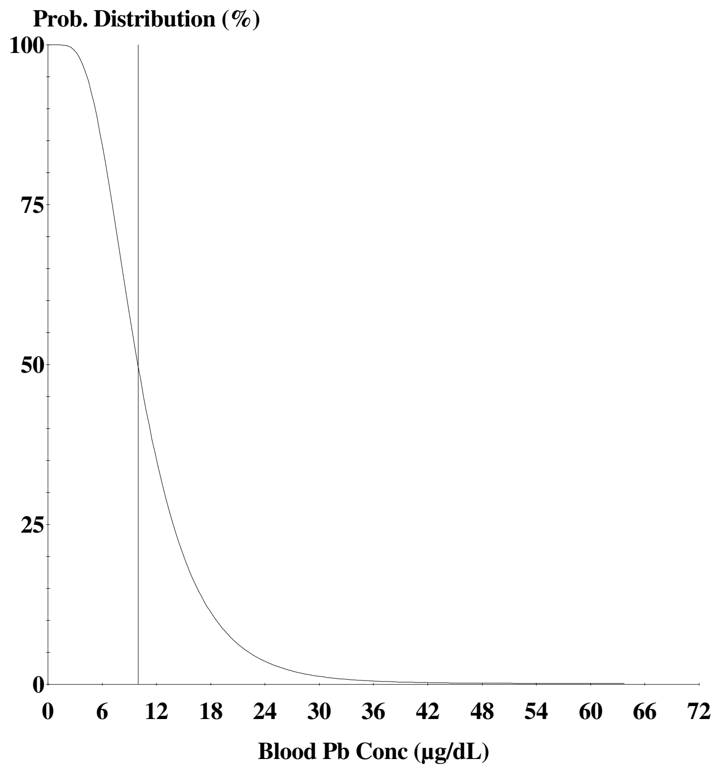
CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	0.833	0.505	21.726
1-2	0.034	0.756	0.528	22.745
2-3	0.062	0.848	0.546	23.487
3-4	0.067	0.836	0.561	24.167
4-5	0.067	0.824	0.579	24.909
5-6	0.093	0.882	0.589	25.370
6-7	0.093	0.966	0.596	25.666

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	2.755	25.839	13.4
1-2	4.581	28.644	12.2
2-3	4.730	29.673	10.9
3-4	4.867	30.498	10.5
4-5	3.716	30.094	9.9
5-6	3.406	30.341	9.3
6-7	3.255	30.577	8.6

C.1.22 MW45-4 Distribution Probability Percent



Cutoff = 10.000 µg/dl
Geo Mean = 10.424
GSD = 1.600
% Above = 53.519

Age Range = 0 to 84 months

Run Mode = Research

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APPENDIX C

MEC HAZARD ASSESSMENT

**MUNITIONS AND EXPLOSIVES OF CONCERN
HAZARD ASSESSMENT FOR**

OPEN DETONATION GROUNDS

**SENECA ARMY DEPOT ACTIVITY
ROMULUS, SENECA COUNTY, NEW YORK**

Prepared for:

U.S. Army Engineering and Support Center, Huntsville

**and
SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK**

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**Contract Number W912DY-08-D-0003
Task Order No. 0013
EPA Site ID# NY0213820830
NY Site ID# 8-50-006**

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C.1 EXECUTIVE SUMMARY

Parsons was tasked by the U.S. Army Corps of Engineers (USACE), Huntsville District, under Contract No. W912DY-08-D-0003, Task Order No. 0013 to prepare a munitions and explosives of concern (MEC) hazard assessment (HA) for the Open Detonation (OD) Grounds, also known as SEAD-45, located at the Seneca Army Depot Activity (SEDA or the Depot) in Romulus, New York. The purpose of this MEC HA is to assess qualitatively the potential explosive hazards to human receptors associated with complete MEC exposure pathways at the OD Grounds munitions response site (MRS). This appendix contains a detailed description of the MEC HA conducted for the OD Grounds, including the information and assumptions used for this assessment.

The MEC HA method was developed by the Technical Working Group for Hazard Assessment, which included representatives from the Department of Defense (DoD), the U.S. Department of the Interior, the United State Environmental Protection Agency (USEPA), and various states and tribes. The method provides an assessment of the acute explosive hazards associated with remaining MEC at an MRS by analyzing site-specific conditions and human issues that affect the likelihood that a MEC accident will occur (Subchapter C.5). Under the MEC HA method, the potential MEC hazards are evaluated qualitatively for each MRS by evaluating site conditions and assigning related "input factors" that generate a total MEC HA score between 125 and 1,000, with the upper limit representing the maximum level of explosive hazard (Subchapters C.7 and C.8).

This MEC HA divides the OD Grounds into two areas for assessment purposes based on differing anticipated explosive hazard characteristics (Subchapter C.6). Previous investigations indicate the density of potential MEC is highest at the center of the OD Grounds, in the vicinity of the OD Hill where the demolition activities took place and areas in the immediate vicinity that received most of the "kick-outs" from those activities. This area is referred to as the "OD Hill area" in this MEC HA. The second assessment area includes areas further away from the OD Hill that received kick-outs, but in lower densities. This second assessment area is referred to as the "Kickout Area" in this MEC HA. The locations of these two assessment areas are shown on Figure 1-2 in the Feasibility Study (FS) Report.

A qualitative baseline evaluation of the potential MEC hazards posed was conducted by reviewing each of the MEC HA input factors for the OD Hill and Kickout areas (Subchapter C.9). Having generated baseline MEC HA scores for each assessment area, different remedial alternatives were further evaluated using the MEC HA method to compare how they might reduce the explosive hazards in each area (Subchapter C.10). The remedial alternatives evaluated were (1) geophysical mapping, intrusive investigation, and installation of an 18-inch thick cap, followed by implementation of land use controls (LUCs) and (2) geophysical mapping, intrusive investigation, excavation, off-site soil disposal, followed by implementation of LUCs. These are referred to here and in the FS as Remedial Alternatives 2 and 3, respectively. Remedial Alternative 1 represents the no action alternative, which is the baseline scenario for this MEC HA.

The results of the MEC HA conducted for both assessment areas are shown in Table C.6 (Subchapter C.9). For the OD Hill area, the baseline score (the no action alternative) results in a MEC HA score of 865. Remedial Alternative 2 (geophysical mapping, intrusive investigation, and installation of an 18-inch thick cap, followed by implementation of LUCs) results in a MEC HA score of 470. Remedial Alternative 3 (geophysical mapping, intrusive investigation, excavation, off-site disposal, and implementation of LUCs) was also evaluated for the OD Hill area, and resulted in a MEC HA score of 470, the same as Alternative 2. The reduction in MEC HA score from 865 to 470 reduces the corresponding Hazard Level rating from 1 ('highest potential explosive hazard conditions') to 4 ('low potential explosive hazard conditions'). Based on these results, there is no significant difference between these remedial alternatives with respect to reduction of explosive hazards at the OD Hill area.

For the Kickout area, the baseline score (the no action alternative) results in a MEC HA score of 715. Remedial Alternatives 2 and 3 both result in a MEC HA score of 445. This reduction in MEC HA score reduces the corresponding Hazard Level rating from 3 ('moderate potential explosive hazard conditions') to 4 ('low potential explosive hazard conditions'). Based on these results, there is no significant difference between these remedial alternatives with respect to reduction of explosive hazards at the Kickout area.

The remaining sections of this appendix provide information on the site history, current and future land use, the MEC HA input and output factors, the details of the baseline MEC HA evaluation, the remedial action alternatives, and the adjusted MEC HA scores resulting from the implementation of these remedial action alternatives.

C.2 SITE HISTORY AND PREVIOUS DISCOVERIES

Since its inception in 1941, SEDA's military mission included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives, and special weapons.

The OD Grounds located in the northwestern corner of the Depot and is designated as SEAD-45. The site is largely meadow with some wooded and heavily brushed areas. Reeder Creek runs through the OD Grounds. Access is possible via a paved road that enters the area from the southeast and roughly parallels the path of Reeder Creek along its western bank. The unnamed access road branches off North-South Baseline Road near Building 2104, which is located in the southeastern corner of the OD Grounds.

The OD Grounds were used to destroy munitions resulting from SEDA's military mission. Operations at the OD Grounds began circa 1941 when the Depot was first constructed and continued at regular intervals until circa 2000 when the military mission of the Depot ceased. Detonations were conducted on an approximately 30-foot high man-made hill constructed to buffer the intensity of planned detonations (the 'OD Hill'). Detonations occurred intermittently since the Depot closed as part of continuing munitions response activities being performed at the Depot. During operations, off specification munitions were placed in an excavated opening in the side of the OD Hill with additional demolition material, covered with a minimum of 8 feet of soil, and detonated remotely. After demolition was completed, explosively displaced portions of the mound were reconstructed by moving displaced and native soils back into the central earthen mound.

These historic operations resulted in MEC, material potentially presenting an explosive hazard (MPPEH), and munitions debris (MD) being expelled ("kicked out") from the OD Hill to the surrounding area. Investigations indicate the highest MPPEH densities are in the vicinity of the OD Hill, which is to be expected as this area contains both the former detonation location and the areas that would have received most “kick outs”. Densities of “kick-outs” from the demolition operations decrease moving away from the demolition operations.

C.3 MEC POTENTIALLY PRESENT ONSITE

Several characterization efforts and investigations for MPPEH have been conducted at the OD Grounds and are summarized in the FS document. Based on historical data, previous investigations and removal actions, the MPPEH present at the site is summarized in Subchapter C.5.

C.4 CURRENT AND FUTURE LAND USE

The OD Grounds are currently closed. The planned future use for the area that encompasses the OD Grounds is projected to be a “Conservation/Recreation Area”. For the remedial alternatives considered in this MEC HA, it is assumed LUCs will be implemented that will restrict the area to non-intrusive recreational activities such as hiking, with no camping allowed. The LUCs will also restrict access to groundwater, prohibit digging or any intrusive activities, and prohibit the use of the site for residential or day care uses.

C.5 EXPLOSIVE HAZARDS AND HAZARD ASSESSMENT

An explosive hazard exists at a site if there is a potentially complete MEC exposure pathway. A complete MEC exposure pathway is present any time a receptor can come near or into contact with MEC and interact with the item in a manner that might result in its detonation. There are three elements of a complete MEC exposure pathway: (1) a source of MEC, (2) a receptor, and (3) the potential for interaction between the MEC source and the receptor. All three of these elements must be present for a potentially complete MEC exposure pathway to exist.

Based on the findings of previous investigations, MPPEH remains or has the potential to remain within the OD Grounds area. Known or suspected munitions include the Mortar 81mm HE; Projectile 75mm HE, Projectile, 57 mm HE, Rocket,3.5 inch HEAT, Bomb 4lb Frag (Butterfly), Grenade 40mm HE, projectile 37mm HE, Projectile 75mm HEAT, Grenade Rifle Antitank, Fuze Bomb Nose, Fuze Tail, Projectile 20mm HEI, Grenade Hand Fragmentation, Fuze, Point Detonating, Fuze Base Detonating, Flare Trip Parachute, Grenade Hand Riot, Signal, Illuminating, Ground, Parachute, Projectile 40mm Practice, Rocket Sub-Caliber and Mortar 60mm Illumination.

The qualitative hazard assessment technique presented here follows the MEC HA method, which provides an assessment of the acute explosive hazards associated with remaining MEC at a MRS by analyzing site-specific conditions and human issues that affect the likelihood that a MEC accident will occur. The MEC HA method focuses on hazards to human receptors and does not directly address environmental or ecological concerns that might be associated with MEC. The process for conducting the MEC HA is described in the MEC HA interim guidance document (USEPA, 2008) and uses input data based on historical documentation, field observations, and the results of previous studies and removal actions. The MEC HA interim guidance was developed by the Technical Working Group for Hazard Assessment, which included representatives from the DoD, the U.S. Department of the Interior, the USEPA, and various states and tribes. The DoD has encouraged use of this method on a trial basis (DoD 2009).

The MEC HA method reflects the basic difference between assessing acute hazards from exposure to MEC and assessing chronic environmental risks from exposure to potential contaminants, such as munitions constituents (MC). An explosive hazard can result in immediate injury or death; therefore, risks from explosive hazards are evaluated either as being present or not present. If the potential for an encounter with MEC exists, then the potential that the encounter may result in injury or death also exists. This MEC HA was conducted to evaluate the baseline conditions for the site with regard to explosive hazards. These baseline evaluations provide the basis for the evaluation and implementation of effective management response alternatives in a FS for this property. The MEC HA also supports hazard communication among stakeholders by organizing site information in a consistent manner for the hazard management decision-making process. However, the MEC HA does not provide a quantitative assessment of MEC hazards and is not used to determine whether or not further action is necessary at a site.

C.6 DEFINING THE AREAS TO BE ASSESSED

A MEC HA is focused on each MRS at a site. However, the MEC-related characteristics of discrete areas within an MRS may differ with regard to the ordnance types and quantities, land uses, receptors, and other factors. If these factors vary significantly, the qualitative MEC hazards associated with the discrete areas are likely to differ. For example, the characteristics of a range impact area and its safety fan are likely to differ with regard to the amount of MEC potentially present or different land use activities may exist that create differing potentials for MEC interaction with human receptors within a large maneuver area.

Different MEC hazards may result in different response alternatives being appropriate for these discrete areas; consequently, an MRS may be subdivided into two or more distinct “assessment areas,” each of which will be the subject of a separate MEC HA for purposes of hazard assessment and subsequent response alternative evaluation. However, if an MRS is likely to be the subject of only one response alternative (e.g., the MRS is small), the MRS may be evaluated as a single assessment area, despite the potential for differing MEC-related characteristics. In this event, the most conservative MEC HA input factors (see below) are selected for purposes of the MEC HA.

Based on the history of the site and the results of previous investigations, the area at and in the immediate vicinity of the OD Hill (within 1,000 feet), where demolition activities were previously conducted, are known to exhibit higher densities of MPPEH than the surrounding areas (e.g, the Kickout area). Due to these differing MEC-related characteristics, the OD Grounds is divided into two areas for assessment purposes: the OD Hill area and the Kickout area.

The OD Hill area, includes the OD Hill where detonations occurred, and the area in the immediate vicinity (within 1,000 feet) that received most of the kick-outs from those detonations. The Kickout area (more than 1,000 feet from the OD Hill) received lower quantities of kick-outs and therefore has a lower potential for MPPEH to be present. Separate MEC HA scores are calculated for each of these assessment areas. The two areas are shown on Figure 1-2 of the FS Report.

C.7 OVERVIEW OF MEC HA INPUT FACTORS

Under the MEC HA method, the potential MEC hazards are evaluated qualitatively for each MRS or assessment area by evaluating three primary factors. These primary factors are related to the three critical elements noted previously are:

- *Severity*: the potential consequences of the effect on a human receptor should a MEC item detonate;
- *Accessibility*: the likelihood that a human receptor will come into contact with a MEC item; and
- *Sensitivity*: the likelihood that a MEC item will detonate if a human receptor interacts with the item.

To complete the baseline MEC HA for each MRS/assessment area, the input factors are reviewed and suitable categories (baseline, surface MEC cleanup, or subsurface MEC cleanup) are selected based on historical documentation and field observations. The input factors for the MEC HA method are highlighted below (USEPA, 2008):

Energetic Material Type: This factor describes the general type of energetic material associated with the munition(s) known or suspected to be present within the MRS or assessment area. The six possible categories for this factor, ranging from the most to least potentially hazardous, are ‘high explosives and low explosive fillers in fragmenting rounds,’ ‘white phosphorus (WP),’ ‘pyrotechnics,’ ‘propellants,’ ‘spotting charges,’ and ‘incendiaries.’ The category selected for each MRS or assessment area is based on the energetic material with the greatest potential explosive hazard known or suspected to be present.

Location of Additional Human Receptors: Human receptors other than the individual who causes a detonation may be exposed to overpressure and/or fragmentation hazards from the detonation of MEC. This factor describes whether or not there are additional human receptors located within the MRS/assessment area or within the explosive safety quantity-distance (ESQD) arc surrounding the MRS/assessment area. The two possible categories for this factor are “inside the MRS or inside the ESQD arc surrounding the MRS” and “outside the ESQD arc.”

Site Accessibility: The site accessibility factor describes how easily human receptors can gain access to the MRS or assessment area and takes into account the various barriers to entry that might be present. The four possible categories of site accessibility range from “full accessibility” (i.e., a site with no barriers to entry) to “very limited accessibility” (i.e., a site with guarded chain link fences or terrain that requires special skills and equipment to access). This factor differs from the Potential Contact Hours factor (see below) and does not include or account for LUCs that might restrict site access. The effects of LUCs are assessed in the FS alternatives assessment.

Potential Contact Hours: This factor accounts for the amount of time receptors spend within the MRS or assessment area during which they might come into contact with MEC and intentionally or unintentionally cause a detonation. Both the number of receptors and the amount of time each receptor spends in the MRS/assessment area are used to calculate the total "receptor-hours/year." This total is calculated for all activities that might result in potential MEC interaction and there are four possible categories, ranging from "many hours" (≥ 1,000,000 receptor-hours/year) to "very few hours" (< 10,000 receptor-hours/year).

Amount of MEC: This input factor describes the relative quantity of MEC anticipated to remain within the MRS or assessment area as a result of past munitions-related activities. For example, a greater quantity of MEC would be expected to be present in a former target area than at a former firing point. The nine possible categories for this factor, from the largest to the least anticipated amount of MEC, range from "target area" and "Open Burning/Open Detonation (OB/OD) area," through "burial pit" and "firing point," to "storage" and "explosives-related industrial facility."

Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth: This factor indicates whether the MEC in the MRS or assessment area are located at depths that might be reached by the anticipated human receptor activities. For the baseline MEC HA, the four possible categories concern whether or not MEC are located at the surface and in the subsurface within the MRS or assessment area, or whether MEC are present in the subsurface only, and whether or not the receptor intrusive depth overlaps with this MEC location.

Migration Potential: The migration potential factor addresses the likelihood that MEC in the MRS or assessment area might migrate by natural processes (e.g., erosion or frost heave) thereby increasing the chance of subsequent exposure to potential human receptors. The two possible categories for this factor are "possible" and "unlikely."

MEC Classification: This factor accounts for how easily a human receptor might cause a detonation of the MEC and relates directly to the MEC sensitivity. The six possible categories for this factor, ranging from the highest to lowest sensitivity (and explosive hazard) are "sensitive unexploded ordnance (UXO)," "other UXO," fuzed sensitive discarded military munitions (DMM)," "fuzed DMM," "unfuzed DMM," and "bulk explosives." The selection of category for each MRS or assessment area is made using the MEC with the highest potential sensitivity known or suspected to be present and, where uncertainty exists, conservative assumptions are made and documented. For example, UXO is always assumed to be present within a known target area, whether or not the investigation uncovers UXO at the site.

MEC Size: This factor indicates how easy it is for a typical human receptor to move the MEC item(s) present within the MRS or assessment area. For example, an individual is considerably more likely to pick up or accidentally kick a hand grenade than a 200-lb. bomb. The basic assumption used in this category is that MEC weighing 90-lbs or more is unlikely to be moved without the use of special equipment. Based on this assumption, the two possible categories for this factor are "small" (i.e., items weighing less than 90-lbs.) and "large" (items weighing 90-lbs. or more). The selection of category for each MRS or assessment area is based on the MEC known or suspected to be present with the highest potential to be moved (i.e., the smallest item).

Each category for each of the MEC HA input factors has an assigned score that relates to the relative contributions of the different input factors to the overall MEC hazard. These scores were developed by the Technical Working Group for HA. These factors and their associated scores for the baseline condition and after cleanup conditions are provided in Table C.1a. The detailed technical basis for the scores assigned is provided in the MEC HA interim guidance document (USEPA, 2008).

Table C.1a
Summary of MEC HA Input Factors and Associated Baseline Scores

Input Factor	Input Factor Category	Baseline Score	Score After Subsurface Cleanup
Energetic Material Type	HE and Low Explosive Fillers in Fragmenting Rounds	100	100
	White Phosphorus	70	70
	Pyrotechnic	60	60
	Propellant	50	50
	Spotting Charge	40	40
	Incendiary	30	30
Location of Additional Human Receptors	Inside the MRS or inside the ESQD arc surrounding the MRS	30	30
	Outside of the ESQD arc	0	0
Site Accessibility	Full Accessibility	80	80
	Moderate Accessibility	55	55
	Limited Accessibility	15	15
	Very Limited Accessibility	5	5
Potential Contact Hours	Many Hours	120	30
	Some Hours	70	20
	Few Hours	40	10
	Very Few Hours	15	5
Amount of MEC	Target Area	180	30
	Open Burning/Open Detonation (OB/OD) Area	180	30
	Function Test Range	165	25
	Burial Pit	140	10
	Maneuver Areas	115	5
	Firing Points	75	5
	Safety Buffer Areas	30	5
	Storage	25	5
	Explosive-Related Industrial Facility	10	5

Table C.1a, cont'd.
Summary of MEC HA Input Factors and Associated Baseline Scores

Input Factor	Input Factor Category	Baseline Score	Score After Subsurface Cleanup
Minimum MEC Depth vs. Maximum Intrusive Depth	**Baseline Condition**: MEC located on surface and in subsurface; **After Cleanup**: intrusive depth overlaps with minimum MEC depth	240	95
	Baseline Condition: MEC located on surface and in subsurface; **After Cleanup**: intrusive depth *does not* overlap with minimum MEC depth	240	25
	Baseline Condition: MEC located only in subsurface; **Baseline Condition or After Cleanup**: intrusive depth overlaps with minimum MEC depth	150	95
	Baseline Condition: MEC located only in subsurface; **Baseline Condition or After Cleanup**: intrusive depth *does not* overlap with minimum MEC depth	50	25
Migration Potential	Possible	30	10
	Unlikely	10	10
MEC Classification	Sensitive UXO	180	180
	UXO	110	110
	Fuzed Sensitive DMM	105	105
	Fuzed DMM	55	55
	Unfuzed DMM	45	45
	Bulk Explosives	45	45
MEC Size	Small	40	40
	Large	0	0

Source: MEC HA interim guidance document (USEPA, 2008)

NOTE: Alternative 2 (geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs), is equivalent to a subsurface clearance for MEC HA purposes.

Scores for the categories are in multiples of five, with a total maximum possible score for all factors of 1,000 and a minimum possible score of 125. These MEC HA scores are *qualitative references only* and should not be interpreted as quantitative measures of explosive hazard. A summary of the maximum possible scores and their related weights with regard to the overall MEC HA score are shown in Table C.1b.

Table C.1b
Summary of MEC HA Scoring

Explosive Hazard Component	Input Factor	Maximum Scores	Weights
Severity	Energetic Material Type	100	10%
	Location of Additional Human Receptors	30	3%
	Component Total	*130*	*13%*
Accessibility	Site Accessibility	80	8%
	Total Contact Hours	120	12%
	Amount of MEC	180	18%
	Minimum MEC Depth vs. Maximum Intrusive Depth	240	24%
	Migration Potential	30	3%
	Component Total	*650*	*65%*
Sensitivity	MEC Classification	180	18%
	MEC Size	40	4%
	Component Total	*220*	*22%*
	Maximum Total Score	**1,000**	**100%**

Source: MEC HA interim guidance document (USEPA, 2008)

C.8 OVERVIEW OF MEC HA OUTPUT FACTORS

Once the categories and scores for all input factors are defined for each MRS or assessment area at the site, the related scores for each category are totaled to calculate an overall MEC HA score for each MRS/assessment area. The total maximum possible MEC HA score for an MRS/assessment area ranges from 125 - 1,000. The MEC HA method identified the associated hazard levels for these scores, which range from 1 to 4. A Hazard Level of 1 indicates the highest potential explosive hazard conditions and a hazard level of 4 indicates low potential explosive hazard conditions. The basis for these hazard levels is detailed in the MEC HA interim guidance document (USEPA, 2008). The total MEC HA scores and associated hazard levels are *qualitative references only* and should not be interpreted as quantitative measures of explosive hazard or as the sole basis for determining whether or not further action is necessary at a site. A summary of the hazard levels and their related MEC HA scores is presented in Table C.2.

Table C.2
Hazard Level Scoring Rankings Table

Hazard Level	Maximum MEC HA Score	Minimum MEC HA Score	Associated Relative Explosive Hazard
1	1,000	840	Highest potential explosive hazard conditions
2	835	725	High potential explosive hazard conditions
3	720	530	Moderate potential explosive hazard conditions
4	525	125	Low potential explosive hazard conditions

Source: MEC HA interim guidance document (USEPA, 2008).

C.9 BASELINE MEC HAZARD EVALUATION

A qualitative baseline evaluation of the potential MEC hazards posed was conducted by reviewing each of the MEC HA input factors described above for the two assessment areas, the OD Hill and Kickout areas. Historical and field investigation data were used to determine the appropriate categories for each MEC HA input factor (see Subchapter C.7).

Based on the site history and previous investigations, the OD Grounds was the location of an area used to destroy munitions by detonation in support of the Army mission. The site is currently closed, although hunting is performed. Numerous MPPEH items including mortars, large or medium caliber projectiles, rockets, bombs, grenades, and fuzes have been removed from this site, some of which were configured with explosives, explosive bursters, and/or fuzes. All of the MPPEH items found were described as UXO based on the terminology used during the time of the investigation. No items were classified as DMM.

Assessment Area Definition: The assessment areas that are the subject of the MEC HA for the OD Grounds are the OD Hill and Kickout areas. The primary differences between these two assessment areas are the potential amount of MEC and contact hours in each one; most other site characteristics are identical for each assessment area.

Energetic Material Type: The MEC items known or suspected to be present within the OD Grounds include mortars, large or medium caliber projectiles, rockets, bombs, grenades, and fuzes. Items with various fillers have been found, and some of these items contain high explosives or are fragmenting rounds. The energetic material type selected for both assessment areas is determined to be ‘high explosives and low explosive filler in fragmenting rounds’, which is the most potentially hazardous of the available selections.

Location of Additional Human Receptors: The MEC item anticipated to be present within the OD Grounds that is considered to be the most hazardous, based on Hazardous Fragment Distance (HFD), is the Mortar, 81mm, HE, M374. For this item, the HFD is 239 feet. On this basis, the ESQD used for this MEC HA is 239 feet for both the OD Hill and Kickout areas. Although receptors are present in both assessment areas, there are no locations within the ESQD of either assessment area where people will congregate. Based on this information, the location of additional human receptors for the OD Hill and Kickout assessment areas is assessed to be ‘outside the ESQD arc.’

Site Accessibility: The Current Site Conditions for both assessment areas assumes that no fence is present to limit access. Based on this information, both the OD Hill and Kickout assessment areas are classified as having ‘full accessibility’ under the Current Site Conditions scenario.

Potential Contact Hours: As described above, the Current Site Conditions for the OD Grounds MRS assumes the site is located at a closed military installation, and the OD Grounds are closed. Hunting is performed in the area. The deer hunting season begins approximately mid November and ends the second week of December.

- Under this scenario for both the OD Hill and the Kickout area, 10 hunters are assumed to hunt in the area, with each spending an average of 12 hours per day, 16 days per year, for a total of 192 hours per year per receptor. Based on this information, the total potential contact hours for the assessment area are calculated to be 1,920 receptor-hours/year, which corresponds to a classification of ‘very few hours’ (less than 10,000 receptor-hours/year) for the OD Hill assessment area.

Amount of MEC: The potential for MEC presence varies within the OD Grounds MRS.

- In the OD Hill assessment area, the primary cause of MPPEH presence is munitions disposal by open detonation. For this reason, a classification of ‘OB/OD Area’ is considered appropriate for purposes of this MEC HA.
- In the Kickout assessment area, which is outside the former OD area and is not where disposal activities were actually conducted, the presence of MPPEH is the result of potential kick-outs only. For this reason, a MEC HA classification of “Safety Buffer Area” is considered appropriate for purposes of this MEC HA.

Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth: At the OD Grounds MRS, MPPEH has been found on the ground surface and to depths of 36 inches bgs. There are currently no intrusive activities performed in this area so the maximum receptor intrusive depth at the site is assumed to be 0 inches. Based on this information, for the OD Hill and the Kickout areas, the minimum MEC depth relative to the maximum receptor intrusive depth for the assessment area is assessed to be 'MEC located surface and subsurface – intrusive depth overlaps with minimum MEC depth'.

Migration Potential: The site conditions at the OD Grounds are currently largely meadow with some wooded and, heavily brushed areas.

- The slopes of the OD Hill assessment area are steep (up to 2:1 ft/ft the eastern side of the hill), and therefore surface erosion that might result in the exposure of buried MEC is likely. Also, temperatures of freezing or below occur regularly each winter and the frost line extends down to approximately 3 ft, which is greater than the minimum MEC depth at the site (see above). Therefore, is possible that both erosion and frost heave might result in the exposure of buried MPPEH and the migration potential is evaluated as 'possible' for this assessment area.
- Within the Kickout assessment area, slopes are milder and not a concern, but freezing temperatures are present each winter. Therefore, it is possible that frost heave might result in the exposure of buried MPPEH and the migration potential is evaluated as 'possible' for this assessment area.

MEC Classification: As described previously, the MPPEH items known or suspected to be present at the OD Grounds MRS include mortars, large or medium caliber projectiles, rockets, bombs, grenades, and fuzes. Some of these items also contain high explosive anti-tank (HEAT) fillers. Mortars, hand grenades, and HEAT munitions are all classified as 'special case' items in the MEC HA guidance. Because UXO items have been found in both assessment areas during prior investigations and because MEC found would be the result of munitions disposal, it is assumed that UXO might be present. Therefore, according to the criteria listed in the MEC HA method, the MEC classification for MPPEH items that might remain at the site is 'Sensitive UXO.'

MEC Size: The MEC items known or suspected to be present within both assessment areas of the OD Grounds MRS include mortars, large or medium caliber projectiles, rockets, bombs, grenades, and fuzes. Based on the criteria defined in the MEC HA method, because many of the munitions known or suspected to be present weigh less than 90 pounds, the MEC size for the site is classified as having the highest potential to be moved or 'small' for purposes of this MEC HA.

MEC HA Baseline Results: The two assessment areas within the OD Grounds MRS, were evaluated separately. The primary differences between the two evaluations were the "Amount of MEC" and "Potential Contact Hours" classifications. The OD Hill assessment area was classified as an "OB/OD Area", while the Kickout assessment area was classified as a "Safety Buffer Area." Total receptor contact hours differed between the two assessment areas, though the classification for both areas was "very few hours." The resulting MEC HA scores are summarized below:

- The OD Hill assessment area has a total MEC HA score of 865 under the current site conditions, which equates to a Hazard Level of 1 (Table C.3). This hazard level indicates an area with ‘Highest potential explosive hazard conditions’ (USEPA, 2008).
- The Kickout assessment area has a total MEC HA score of 715 under the current site conditions, which equates to a Hazard Level of 3 (Table C.3). This hazard level indicates an area with ‘moderate potential explosive hazard conditions’ (USEPA, 2008).

This information provides the baseline for the assessment of response alternatives presented in Subchapter C.10.

Note that the total MEC HA score and the associated hazard level are *qualitative references only* and should <u>not</u> be interpreted as quantitative measures of explosive hazard. Also, this MEC HA does <u>not</u> address or otherwise evaluate potential risks related to munitions constituents posed by that might be present at the site.

Table C.3
Summary of MEC HA Baseline Scores
OD Hill and Kickout Assessment Areas
Current Site Conditions

Explosive Hazard Component	**Input Factors**	**Category Selected for MRS/Area**	**Score [1], [2] (*Max. Score*)**	
			OD Hill	**Kickout**
Severity	Energetic Material Type	High explosives and low explosive filler in fragmenting rounds	100 (*100*)	100 (*100*)
	Location of Additional Human Receptors	Outside of the ESQD arc	0 (*30*)	0 (*30*)
Accessibility	Site Accessibility	Full accessibility	80 (*80*)	80 (*80*)
	Total Contact Hours	Very few hours	15 (*120*)	15 (*120*)
	Amount of MEC	OB/OD Area (180) Safety Buffer Area (30)	180 (*180*)	30 (*180*)
	Minimum MEC Depth vs. Maximum Intrusive Depth	MEC located in surface and subsurface; max. intrusive depth overlaps min. MEC depth	240 (*240*)	240 (*240*)
	Migration Potential	Possible	30 (*30*)	30 (*30*)
Sensitivity	MEC Classification	Sensitive UXO	180 (*180*)	180 (*180*)
	MEC Size	Small	40 (*40*)	40 (*40*)
Total MEC HA Score [2]			**865 (*1,000*)**	**715 (*1,000*)**
MEC HA Hazard Level			**1**[3]	**3**[4]

(1) Scores assigned for each factor as listed and described in MEC HA interim guidance document (USEPA, 2008). The maximum possible MEC HA score is listed in parentheses beneath the assigned score(s) for reference purposes.

(2) The scores for the input factors are based on the baseline condition.

(3) A MEC HA Hazard Level of 1 indicates an area with “Highest potential explosive hazard conditions”.

(4) A MEC HA Hazard Level of 3 indicates an area with “Moderate potential explosive hazard conditions”.

C.10 EVALUATION OF POTENTIAL REMEDIAL ACTIONS

In addition to providing a technique to evaluate baseline MEC hazards, the MEC HA method also establishes a process to evaluate qualitatively the hazard mitigation that would be achieved by remedial actions. This process is based on assumptions made regarding the effects of a given remedial response (e.g., LUCs, surface cleanup, subsurface cleanup), coupled with modified scores for MEC HA input factors, to evaluate how the MEC HA score might be reduced following implementation of the response. The primary purpose of this process is to support the evaluation of response alternatives conducted during an FS; i.e., this evaluation should not be used as the sole basis upon which to recommend a remedial response. As with the baseline score, these total MEC HA scores and the associated hazard levels are *qualitative references only* and should not be interpreted as quantitative measures of explosive hazard.

Two potential remedial scenarios are evaluated in this document: The first scenario is presented as Alternative 2; the second as Alternative 3. Future land use under both scenarios would be assumed to be non-intrusive recreational land use (e.g., hiking, no camping). A brief description of each of these potential remedial alternative scenarios is provided in the following subchapters, together with the associated modifications to the MEC HA score.

The first remedial alternative considered (Alternative 2) would include geophysical mapping, intrusive investigation, the installation of an 18-inch cap compliant with New York State Department of Environmental Conservation (NYSDEC) Solid Waste Regulations for leaving waste in place, implementation of LUCs, and long term monitoring and maintenance. The net effect of installing the cap is considered equivalent to a subsurface MEC clearance to a depth of 18 inches. Under this scenario, activities at the property would be change to non-intrusive conservation/recreational use (hiking, no camping), monitoring and maintenance of the cap, and LUCs.

The second remedial alternative (Alternative 3) considered would be geophysical mapping, intrusive investigation, excavation, off-site disposal, and implementation of LUCs. Under this scenario, activities at the property would change to conservation/recreational use (hiking, no camping).

Both remedial alternatives considered in this MEC HA reflect a scenario under which the property is remediated and can revert to restricted public use. Under both alternatives, the LUCs would prohibit intrusive activities, prohibit use or access of groundwater, and prohibit any future land use other than non-intrusive recreation (e.g., no residential or day care use).

C.10.1 OD Hill Area

Both scenarios were considered for the OD Hill Assessment Area. Using the above assumptions, these scenarios modify the input assumptions for the assessment area with regard to *potential contact hours*, *amount of MEC, minimum MEC depth vs. maximum intrusive depth, and migration potential*. All other input assumptions and related MEC HA scores are unchanged. In accordance with USEPA (2008) guidance, the scores assigned for these categories under the baseline condition are reduced to reflect subsurface MEC clearance to either 18 inches (Remedial Alternative 2) or 36 inches (Remedial Alternative 3). Therefore, in both scenarios, after cleanup, activities do not overlap with MEC location.

Consequently, human receptors are no longer as likely to come into contact with MEC in the assessment area. The modified assumptions and their affect on the associated MEC HA input factors are described below. The effect of both scenarios is the same on MEC HA scoring and both scenarios are addressed together in the following sections.

MRS Definition: Unchanged from baseline evaluation.

Energetic Material Type: Unchanged from baseline evaluation.

Location of Additional Human Receptors: Unchanged from baseline evaluation.

Site Accessibility: Unchanged from baseline evaluation.

Potential Contact Hours: As described above, the future land use scenario considered for the OD Hill once a remedial response has been implemented assumes the future use of conservation/recreation, which includes hiking but no camping. Though it is not anticipated that the OD Grounds will become a hiking destination, for the purposes of this evaluation, this MEC HA conservatively assumes that 2,000 people visit the area each year and each person is assumed to spend an average of 4 hours on the site, for a total of 8,000 hours per year. No intrusive activities are permitted or expected to occur. Based on this information, the total potential contact hours for the assessment area under the future scenario are calculated to be 8,000 receptor-hours/year. This value corresponds to a classification of 'very few hours' (less than 10,000 receptor-hours/year). Even though the potential contact hours classification does not change, the MEC HA score is reduced from *15* to *5* for this input factor, because the remedial action (surface clearance and placement of the cap) is equivalent to a subsurface MEC clearance of 18 inches (USEPA, 2008).

Amount of MEC: The potential MEC presence at the OD Hill assessment area is the result of open detonation; therefore, the classification of 'OB/OD Area' is selected. However, the MEC HA associated score for this input factor is reduced from *180* to *30* due to the remedial action (surface clearance and the placement of cap) which is equivalent to a subsurface MEC clearance of 18 inches (USEPA, 2008).

Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth: The maximum receptor intrusive depth at the site is anticipated to be 0 feet with a future land use of non-intrusive conservation/recreation (hiking, no camping) and LUCs that restrict intrusive activity. As a result of the remedial actions, the minimum MEC depth would change to 18 inches (Remedial Alternative 2) and 36 inches (Remedial Alternative 3). The maximum intrusive depth for both scenarios would no longer overlap with the minimum MEC depth. The input parameter would change to 'MEC located only in subsurface – intrusive depth *does not* overlap with minimum MEC depth'. This approach has the result of reducing the score for this input factor from *240* to *25* for both scenarios.

Migration Potential: The selection for this factor ('possible') is unchanged from the baseline evaluation. However, the MEC HA associated score for this input factor is reduced from *30* to *10* for both remedial action scenarios due to the installation of the cap (equivalent to a subsurface clearance) or the excavation (USEPA, 2008).

MEC Classification: Unchanged from baseline evaluation.

MEC Size: Unchanged from baseline evaluation.

MEC HA Results: Accounting for these score modifications resulting from either Remedial Alternative 2 (or Remedial Action 3 and a land use change for both to non-intrusive conservation/recreational (hiking, no camping), the total MEC HA score for the OD Hill assessment area would be reduced from 865 to 470. This reduction in the MEC HA score reduces the corresponding Hazard Level rating from 1 (‘highest potential explosive hazard conditions’) to 4 (‘low potential explosive hazard conditions’) for both remedial alternatives. The revised MEC HA scores for both alternatives are shown in Table C.4.

Table C.4
Summary of MEC HA Score
Remedial Alternative 2 and Remedial Alternative 3
OD Hill Assessment Area

Explosive Hazard Component	**Input Factors**	**Category Selected for Area**	**Score** (1)(2) **(*Max. Score*)** **Alt 2 and Alt 3**
Severity	Energetic Material Type	High explosives and low explosive filler in fragmenting rounds	100 (*100*)
	Location of Additional Human Receptors	Outside of the ESQD arc	0 (*30*)
Accessibility	Site Accessibility	***Full accessibility***	***80*** ***(80)***
	Total Contact Hours	Very few hours	***5*** ***(120)***
	Amount of MEC	OB/OD Area	***30*** ***(180)***
	Minimum MEC Depth vs. Maximum Intrusive Depth	***MEC located only in subsurface; max. intrusive depth does not overlap with min. MEC depth***	***25*** ***(240)***
	Migration Potential	Possible	***10*** **(*30*)**
Sensitivity	MEC Classification	Sensitive UXO	180 (*180*)
	MEC Size	Small	40 (*40*)
Total MEC HA Score			**470** **(*1,000*)**
MEC HA Hazard Level			**4** (3)

(1) Scores assigned for each factor for Alternative 2 are considered equivalent to an 18 inch subsurface cleanup and are scored under a "subsurface cleanup" scenario as listed and described in USEPA (2008). The maximum possible MEC HA score is listed in parentheses beneath the assigned score(s) for reference purposes.

(2) Categories and/or scores that change from the baseline as a result of the assumed future scenario are shown in ***bold italics***.

(3) A MEC HA Hazard Level of 4 indicates an area with "Low potential explosive hazard conditions" (USEPA, 2008).

C.10.2 Kickout Area

Alternatives 2 and 3 were considered for the Kickout area. Using the above assumptions, this scenario modified the input assumptions for this assessment area with regard to *potential contact hours, amount of MEC, minimum MEC depth vs. maximum intrusive depth, and migration potential*. All other input assumptions and related MEC HA scores are unchanged. In accordance with USEPA (2008) guidance, the scores assigned for these categories under the baseline condition are reduced to reflect subsurface MEC clearance to depth of detection (Remedial Alternative 3). After cleanup, activities do not overlap with MEC location. Consequently, human receptors are no longer as likely to come into contact with MEC in the assessment area. The modified assumptions and their affect on the associated MEC HA input factors are described below.

MRS Definition: Unchanged from baseline evaluation.

Energetic Material Type: Unchanged from baseline evaluation.

Location of Additional Human Receptors: Unchanged from baseline evaluation.

Site Accessibility: Unchanged from baseline evaluation.

Potential Contact Hours: As described above, the future land use scenario considered for the Kickout assessment area after a remedial response has been implemented assumes the future use of conservation/recreation, which includes hiking but no camping. Though it is not anticipated that the OD Grounds will become a hiking destination, for the purposes of this evaluation, this MEC HA conservatively assumes that 2,000 people visit the area each year and each person is assumed to spend an average of 4 hours on the site, for a total of 8,000 hours per year. No intrusive activities are permitted or expected to occur. Based on this information, the total potential contact hours for the assessment area under the future scenario are calculated to be 8,000 receptor-hours/year. This value corresponds to a classification of ‘very few hours’ (less than 10,000 receptor-hours/year). Even though the potential contact hours classification does not change, the MEC HA score is reduced from *15* to *5* for this input factor, due to the remedial action (subsurface clearance) (USEPA, 2008).

Amount of MEC: The potential MEC presence in the Kickout assessment area is the result of kick-outs from open detonation, but with no actual detonation occurring in the area. Therefore, the MEC HA classification of ‘Safety Buffer Area’ is selected. However, the MEC HA associated score for this input factor is reduced from *30* to *5* due to the remedial action (subsurface clearance) (USEPA, 2008).

Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth: The maximum receptor intrusive depth at the site is anticipated to be 0 feet with a future land use of non-intrusive conservation/recreation (hiking, no camping) and LUCs that restrict intrusive activity. As a result of the remedial action (subsurface clearance), the minimum MEC depth would change to 36 inches. The maximum intrusive depth would no longer overlap with the minimum MEC depth. The input parameter would change to ‘MEC located only in subsurface – intrusive depth *does not* overlap with minimum MEC depth’. This approach has the result of reducing the score for this input factor from *240* to *25*.

Migration Potential: The selection for this factor ('possible') is unchanged from the baseline evaluation. However, the MEC HA associated score for this input factor is reduced from *30* to *10* due to the subsurface clearance (USEPA, 2008).

MEC Classification: Unchanged from baseline evaluation.

MEC Size: Unchanged from baseline evaluation.

MEC HA Results: Accounting for these score modifications resulting from Remedial Alternative 2 or Remedial Alternative 3 , the total MEC HA score for the Kickout assessment area would be reduced from 715 to 445 under both remedial alternatives. This reduction in MEC HA score reduces the corresponding Hazard Level rating from 3 ('moderate potential explosive hazard conditions') to 4 ('low potential explosive hazard conditions'). The revised MEC HA scores for the Kickout assessment area are shown in Table C.5.

Table C.5
Summary of MEC HA Score
Remedial Alternative 2 and Remedial Alternative 3
Kickout Assessment Area

Explosive Hazard Component	**Input Factors**	**Category Selected for Area**	**Score (1)(2) (*Max. Score*)** **Alt 2 and Alt 3**
Severity	Energetic Material Type	High explosives and low explosive filler in fragmenting rounds	100 (100)
	Location of Additional Human Receptors	Outside of the ESQD arc	0 (30)
Accessibility	Site Accessibility	***Full accessibility***	***80*** ***(80)***
	Total Contact Hours	Very few hours	***5*** ***(120)***
	Amount of MEC	Safety Buffer Area	***5*** ***(180)***
	Minimum MEC Depth vs. Maximum Intrusive Depth	***MEC located only in subsurface; max. intrusive depth does not overlap with min. MEC depth***	***25*** ***(240)***
	Migration Potential	Possible	***10*** ***(30)***
Sensitivity	MEC Classification	Sensitive UXO	180 (180)
	MEC Size	Small	40 (40)
Total MEC HA Score			**445** **(1,000)**
MEC HA Hazard Level			**4 (3)**

(1) Scores assigned for each factor are scored under a "subsurface cleanup" scenario as listed and described in USEPA (2008). The maximum possible MEC HA score is listed in parentheses beneath the assigned score(s) for reference purposes.

(2) Categories and/or scores that change from the baseline as a result of the assumed future scenario are shown in bold italics.

(3) A MEC HA Hazard Level of 4 indicates an area with "Low potential explosive hazard conditions" (USEPA, 2008).

C.11 DISCUSSION OF RESULTS

A summary of the results of the MEC HAs conducted for the baseline and possible future remedial alternatives at the OD Grounds is presented in Table C.6. For the OD Hill area, the baseline score (the no action alternative) results in a MEC HA score of 865 and a Hazard Level of 1 ('highest potential explosive hazard conditions'). As shown in the table, Remedial Alternative 2 and Remedial Alternative 3, both result in the same MEC HA score of 470 for the OD Hill assessment area. Based on this result, both remedial alternative scenarios, if implemented, would significantly reduce the MEC hazards at the site (from 'highest potential explosive hazard conditions' to 'low potential explosive hazard conditions'). There would be no differences between these remedial alternatives with regard to reduction explosive hazards at the OD Hill area. The revised MEC HA scores for both alternatives are shown in Table C.6.

For the Kickout area, the baseline score (the no action alternative) results in a MEC HA score of 715 and a Hazard Level of 3 ('moderate potential explosive hazard conditions'). Remedial Alternative 2 and 3 both result in the same MEC HA score of 445. Based on this result, the remedial action scenario, if implemented, would reduce the MEC hazards at the site (from 'moderate potential explosive hazard conditions' to 'low potential explosive hazard conditions'). The revised MEC HA score for this alternative is shown in Table C.6.

Based on these results, there is no significant difference between these remedial alternatives with respect to reduction of explosive hazards at the OD Hill area. As has been noted before, these total MEC HA scores and the associated hazard levels are *qualitative references only* and should <u>not</u> be interpreted as quantitative measures of explosive hazard, nor should the results of this evaluation be used as the sole basis on which to recommend a remedial response. Also, this MEC HA does <u>not</u> address or otherwise evaluate potential risks related to MC that might be present at the site.

Table C.6
Summary of MEC HA Results for All Evaluated Scenarios and Assessment Areas
OD Grounds

Scenario Description	**Energetic Material Type**	**Location of Additional Human Receptors**	**Site Accessibility**	**Total Contact Hours**	**Amount of MEC**	**Minimum MEC Depth vs. Maximum Intrusive Depth**	**Migration Potential**	**MEC Classification**	**MEC Size**	**Total MEC HA Score** *(125-1,000)*	**MEC HA Hazard Level** *(1-4)*
Maximum MEC HA Score	*100*	*30*	*80*	*120*	*180*	*240*	*30*	*180*	*40*	***1,000***	***1***
OD Hill Assessment Area											
BASELINE SCENARIO: Current Conditions/No Action Alternative Current Site Conditions No Public Use.	100 *HE or fragmenting rounds*	0 *Outside MRS or ESQD arc*	*80* *Full accessibility*	15 *Very few hours*	180 *OB/OD Area*	240 *MEC located surface and subsurface; max. intrusive depth overlaps min. MEC depth*	30 *Possible*	180 *Sensitive UXO*	40 *Small*	865	**1** *Highest potential (840-1000)*
REMEDIAL ACTION Alternative - 2: geophysical mapping, intrusive investigation, Installation of cap, followed by implementation of LUCs Future Use: restricted Recreational (1)(2)	100 *HE or fragmenting rounds*	0 *Outside MRS or ESQD arc*	*80* *Full accessibility*	***5*** ***Very few hours***	***30*** ***OB/OD Area***	***25*** ***MEC located in subsurface only; max. intrusive depth <u>does not</u> overlap min. MEC depth***	***10*** ***Possible***	180 *Sensitive UXO*	40 *Small*	**470**	**4** *Low potential (125-525)*
REMEDIAL ACTION Alternative - 3:: geophysical mapping, intrusive investigation, subsurface clearance to depth of detection, off-site disposal, and implementation of LUCs Future Use: restricted Recreational (1)(2)	100 *HE or fragmenting rounds*	0 *Outside MRS or ESQD arc*	*80* *Full accessibility*	***5*** ***Very few hours***	***30*** ***OB/OD Area***	***25*** ***MEC located in subsurface only; max. intrusive depth <u>does not</u> overlap min. MEC depth***	***10*** ***Possible***	180 *Sensitive UXO*	40 *Small*	**470**	**4** *Low potential (125-525)*
Kickout Assessment Area											
BASELINE SCENARIO: Current Conditions/No Action Alternative Current Site Conditions No Public Use.	100 *HE or fragmenting rounds*	0 *Outside MRS or ESQD arc*	*80* *Full accessibility*	**15** ***Very few hours***	**30** ***Safety Buffer Area***	**240** ***MEC located surface and subsurface; max. intrusive depth overlaps min. MEC depth***	**30** ***Possible***	180 *Sensitive UXO*	40 *Small*	715	**3** *Moderate potential (530-720)*
REMEDIAL ACTION Alternative - 2: geophysical mapping, intrusive investigation, Installation of cap, followed by implementation of LUCs Future Use: restricted Recreational (1)(2)	100 *HE or fragmenting rounds*	0 *Outside MRS or ESQD arc*	*80* *Full accessibility*	***5*** ***Very few hours***	***5*** ***Safety Buffer Area***	***25*** ***MEC located in subsurface only; max. intrusive depth <u>does not</u> overlap min. MEC depth***	***10*** ***Possible***	180 *Sensitive UXO*	40 *Small*	**445**	**4** *Low potential (125-525)*
REMEDIAL ACTION Alternative -3: geophysical mapping, intrusive investigation, subsurface clearance to depth of detection, off-site disposal, and implementation of LUCs Future Use: restricted Recreational (1)(2)	100 *HE or fragmenting rounds*	0 *Outside MRS or ESQD arc*	*80* *Full accessibility*	***5*** ***Very few hours***	***5*** ***Safety Buffer Area***	***25*** ***MEC located in subsurface only; max. intrusive depth <u>does not</u> overlap min. MEC depth***	***10*** ***Possible***	180 *Sensitive UXO*	40 *Small*	**445**	**4** *Low potential (125-525)*

(1) For these remedial actions, scores are assigned for each factor assuming a 'subsurface cleanup' scenario as listed and described in the MEC HA interim guidance document (USEPA, 2008). The installation of an 18 inch cap is equivalent to a subsurface clearance to 18 inches (USEPA, 2008).

(2) Categories and/or scores that change from the baseline as a result of the assumed future scenario are shown in ***bold italics***.

C.12 GLOSSARY OF TERMS

Discarded Military Munitions (DMM): Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

Munitions and Explosives of Concern (MEC): This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: (a) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 101 (e)(5); (b) Discarded Military Munitions (DMM), as defined in 10 U.S.C. 2710(e)(2), or (c) Munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

Munitions Potentially Presenting an Explosive Hazard (MPPEH): Material that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris); or potentially contains a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within the DoD established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Unexploded Ordnance (UXO): Military munitions that: (a) Have been primed, fuzed, armed, or otherwise prepared for action; (b) Have been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (c) Remain unexploded either by malfunction, design, or any other cause (10 U.S.C. 101 (e)(5)).

C.13 REFERENCES

DoD, 2009. Memorandum for the Assistant Secretary of the Army (Installations and Environment); Assistant Secretary of the Navy (Installations and Environment); and Assistant Secretary of the Air Force (Installations, Environment, and Logistics). Subject: Trial Use of the Interim Munitions and Explosives of Concern Hazard Assessment (MEC HA) Methodology. Signed by Wayne Arny, Deputy Under Secretary of Defense (Installations and Environment). Office of the Under Secretary of Defense, 3000 Defense Pentagon, Washington, D.C. January 29, 2009.

Engineering Science, Inc, 1995. Expanded Site Investigation for Seven High Priority SWMU SEAD 1,16,17,24, 25,26,45, Seneca Army Depot. December 1995.

Parsons, 2004. Final Ordnance and Explosives Engineering Evaluation/Cost Analysis Report (OE EE/CA), Seneca Army Depot. February 2004.

Parsons, 2010a. Additional Munitions Response Site Investigation Report, Seneca Army Depot. May 2010.

USEPA, 2008. Munitions and Explosives of Concern Hazard Assessment Methodology. Interim. http://www.epa.gov/fedfac/documents/mec_methodology_document.htm. EPA 505B08001. October 2008.

Weston, 2005. Final Site Specific Project Report SEAD45/115 Open Detonation Grounds Ordnance and Explosives Removal Phase I Geophysical Survey and Cost Estimate, Seneca Army Depot. March 2005.

Weston, 2006. Draft Phase II Ordnance and Explosives Removal Report. March 2006.

MEC HA Summary Information

		Comments
Site ID:	OD Hill Assessment Area	
Date:	4/2/2012	

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

OD Grounds/OD Hill Assessment Area

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	Expanded Site Investigation (ESI) for Seven High Priority Solid Waste
2	Final Ordnance and Explosives Engineering Evaluation/Cost Analysis Report
3	Final Site Specific Project Report SEAD45/115 Open Detonation Grounds
4	Draft Phase II Ordnance and Explosives Removal Report (Weston, March
5	Additional Munitions Response Site Investigation Report, Seneca Army
6	Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)
7	
8	
9	
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 72.1 acres
2. Past munitions-related use:

OB/OD Area

3. Current land-use activities (list all that occur):

Closed OD Area, Hunting.

4. Are changes to the future land-use planned? No — Comments: No changes to land use without remediation.
5. What is the basis for the site boundaries?

Area determined to have very high MEC density from previous investigations.

6. How certain are the site boundaries?

Certain. General area planned to be capped is 0-1000' from the OD Hill. Some variations may be necessary due to topography during implementation.

Reference(s) for Part B:

Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

C. Historical Clearances

1. Have there been any historical clearances at the site? No, none — Comments: Intrusive investigation, but no clearances.
2. If a clearance occurred:
   a. What year was the clearance performed?
   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

Reference(s) for Part C:

Select Ref(s)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **OD Hill Assessment Area**
Date: **4/2/2012**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Mortars	81	mm	M374	High Explosive	Yes		UNK	0	Surface and Subsurface	Item with greatest HFD
2	Fuzes							UNK	0	Surface and Subsurface	Smallest MEC items
3	Fuzes							UNK	0	Surface and Subsurface	Smallest MEC Items
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Site ID: **OD Hill Assessment Area**
Date: **4/2/2012**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Hunting	10	192	**1,920**	0	Assume 10 hunters, 12 hours/day 16 days/month, 1 months/year
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **1,920**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Site ID: **OD Hill Assessment Area**
Date: **4/2/2012**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1	geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs	1.5	Full Accessibility	Yes	cleanup of MECs located both on the surface and subsurface	The net effect of the cap is a sub-surface clearance to 1.5 ft.
2	geophysical mapping, intrusive investigation, subsurface clearance to depth of detection, off-site disposal, and implementation of LUCs	3	Full Accessibility	Yes	cleanup of MECs located both on the surface and subsurface	
3						
4						
5						
6						

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Site ID: **OD Hill Assessment Area**
Date: **4/2/2012**

This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Hiking	200	4	**800**	0	People: (20 people/month)(10 mo/yr); Hours: (1 hr/d) (4d/yr)
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **800**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

investigation, subsurface clearance to depth of detection, off-site disposal, and implementation of LUCs

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	non-intrusive Conservation/Recreation, (hiking, no camping)	200	4	**800**	0	People: (20 people/month)(10 mo/yr); Hours: (1 hr/d) (4d/yr)
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **800**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Site ID: **OD Hill Assessment Area**
Date: **4/2/2012**

Energetic Material Type Input Factor Categories

Comments

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 239 feet

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No

3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities
Item #1. Mortars (81mm, High Explosive)

Select MEC(s)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc? No

6. Please describe the facility or feature.
Hiking trails, wildlife observation areas

MEC Item(s) used to calculate the ESQD for future use activities
Item #1. Mortars (81mm, High Explosive)

Select MEC(s)

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities — ***Score***

Select the category that best describes the site accessibility under the current use scenario:

Full Accessibility

Baseline Conditions: **80**
Surface Cleanup: **80**
Subsurface Cleanup: **80**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Full Accessibility

Baseline Conditions: **80**
Surface Cleanup: **80**
Subsurface Cleanup: **80**

Reference(s) for above information:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Response Alternative No. 1: geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.

Baseline Conditions: **80**
Surface Cleanup: **80**
Subsurface Cleanup: **80**

Response Alternative No. 2: geophysical mapping, intrusive investigation, subsurface clearance to depth of detection, off-site disposal, and

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.

Baseline Conditions: **80**
Surface Cleanup: **80**
Subsurface Cleanup: **80**

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

Current Use Activities:

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **1,920** receptor hrs/yr

Based on the table above, this corresponds to a input factor score for baseline conditions of: **15** Score

Future Use Activities:

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr

Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1: geophysical mapping, intrusive investigation,

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **800**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Response Alternative No. 2: geophysical mapping, intrusive investigation,

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **800**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC:	***Score***
OB/OD Area	
Baseline Conditions:	**180**
Surface Cleanup:	**110**
Subsurface Cleanup:	**30**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft

The deepest intrusive depth: **0** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered. **240** ***Score***

Future Use Activities

Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. ***Score***

Response Alternative No. 1: geophysical mapping, intrusive investigation, installation of

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1.5** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **0** ft

Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup: **25**

Response Alternative No. 2: geophysical mapping, intrusive investigation, subsurface

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **3** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **0** ft

Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup: **25**

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items?

Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

The slopes of the OD Hill are steep (up to .60 ft/ft on the eastern side of the hill), and therefore surface erosion that might result in the exposure of buried MEC is likely. Also, temperatures of freezing or below occur regularly each winter and the frost line extends down to approximately 3 feet, which is greater than the minimum MEC depth at the site.

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'OB/OD Area'.

Has a technical assessment shown that MEC in the OB/OD Area is DMM? — No

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: — Yes

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

UXO Special Case	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'UXO Special Case'.

	Score
Baseline Conditions:	**180**
Surface Cleanup:	**180**
Subsurface Cleanup:	**180**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	OD Hill Assessment Area	a. Scoring Summary for Current Use Activities	
Date:	4/2/2012	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		OB/OD Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	865
		Hazard Level Category	1

Site ID:	OD Hill Assessment Area	b. Scoring Summary for Future Use Activities	
Date:	4/2/2012	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours			
V. Amount of MEC		OB/OD Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	610
		Hazard Level Category	3

Site ID:	OD Hill Assessment Area	c. Scoring Summary for Response Alternative 1: geophysical mapping, intrusive investigation, installation o	
Date:	4/2/2012	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		OB/OD Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	25
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	470
		Hazard Level Category	4

Site ID:	OD Hill Assessment Area	d. Scoring Summary for Response Alternative 2: geophysical mapping, intrusive investigation, subsurface cl	
Date:	4/2/2012	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		OB/OD Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	25
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	470
		Hazard Level Category	4

MEC HA Hazard Level Determination		
Site ID: OD Hill Assessment Area		
Date: 4/2/2012		
	Hazard Level Category	Score
a. Current Use Activities	1	865
b. Future Use Activities	3	610
c. Response Alternative 1: geophysical mapping, intrusive investigation, installation of cap, followed by implementation of	4	470
d. Response Alternative 2: geophysical mapping, intrusive investigation, subsurface clearance to depth of detection, off-site	4	470
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		

Characteristics of the MRS	
Is critical infrastructure located within the MRS or within the ESQD arc?	No
Are cultural resources located within the MRS or within the ESQD arc?	No
Are significant ecological resources located within the MRS or within the ESQD arc?	No

MEC HA Summary Information

Comments

Site ID: OD Grounds-Kickout Area
Date: 4/2/2012

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

OD Grounds MRS - Kickout Area

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	Expanded Site Investigation (ESI) for Seven High Priority Solid Waste
2	Final Ordnance and Explosives Engineering Evaluation/Cost Analysis
3	Final Site Specific Project Report SEAD45/115 Open Detonation Grounds
4	Draft Phase II Ordnance and Explosives Removal Report (Weston, March
5	Additional Munitions Response Site Investigation Report, Seneca Army
6	Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)
7	
8	
9	
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 216.4 ac
2. Past munitions-related use:
Safety Buffer Areas
3. Current land-use activities (list all that occur):
Closed OD Area, Hunting
4. Are changes to the future land-use planned? No — Comments: No changes to land use without remediation.
5. What is the basis for the site boundaries?
Area determined to have high MEC density from previous investigations.
6. How certain are the site boundaries?
Certain. Area greater than 1000' radius from OD Hill center, and which investigations have determined to have high MEC density present. Some variations may be necessary due to topography during implementation.

Reference(s) for Part B:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012) Select Ref(s)

C. Historical Clearances

1. Have there been any historical clearances at the site? No, none — Comments: Intrusive investigation, but no clearances.
2. If a clearance occurred:
   a. What year was the clearance performed?
   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

Reference(s) for Part C:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012) Select Ref(s)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **OD Grounds-Kickout Area**
Date: **4/2/2012**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Mortars	81	mm	M374	High Explosive	Yes		UNK	0	Surface and Subsurface	Item with greatest HFD
2	Fuzes							UNK	0	Surface and Subsurface	Smallest Item
3	Fuzes							UNK	0	Surface and Subsurface	Smallest Item
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Site ID: **OD Grounds-Kickout Area**
Date: **4/2/2012**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Hunting	10	192	**1,920**	0	Assume 10 hunters, 12 hours/day 16 days/month, 1 months/year
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **1,920**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:

Select Ref(s)

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

Site ID: **OD Grounds-Kickout Area**
Date: **4/2/2012**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1	geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs	3	Full Accessibility	Yes	cleanup of MECs located both on the surface and subsurface	
2						
3						
4						
5						
6						

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Site ID: **OD Grounds-Kickout Area**
Date: **4/2/2012**

This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Hiking	2,000	4	8,000	0	People: (200 people/mongh)(10 month/year); Hours (1 hr/d) (4d/yr)
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **8,000**
Maximum intrusive depth at site (ft): **0**

Reference(s) for table above:
Draft Feasibility Study, Seneca Army Depot (Parsons, 2012)

Select Ref(s)

Land Use Activities Planned After Response Alternative #2:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

Site ID: **OD Grounds - Buffer Area**
Date: **4/1/2012**

Energetic Material Type Input Factor Categories

Comments

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

Score

Baseline Conditions: **100**
Surface Cleanup: **100**
Subsurface Cleanup: **100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 239 feet

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No

3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities
Item #1. Mortars (81mm, High Explosive)

Select MEC(s)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

Score

Baseline Conditions: **0**
Surface Cleanup: **0**
Subsurface Cleanup: **0**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

Select MEC(s)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Please answer Question 5 above to determine the scores.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities ***Score***

Select the category that best describes the site accessibility under the current use scenario:

Full Accessibility

Baseline Conditions:	**80**
Surface Cleanup:	**80**
Subsurface Cleanup:	**80**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

Select Ref(s)

Response Alternative No. 1: geophysical mapping, intrusive investigation, installation of cap, followed by implementation of LUCs

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.

Baseline Conditions:	**80**
Surface Cleanup:	**80**
Subsurface Cleanup:	**80**

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

***Current Use Activities*:**

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **1,920** receptor hrs/yr

Based on the table above, this corresponds to a input factor score for baseline conditions of: **15** Score

***Future Use Activities*:**

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr

Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1: geophysical mapping, intrusive investigation,

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **8,000**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Safety Buffer Areas

Baseline Conditions:	**30**
Surface Cleanup:	**10**
Subsurface Cleanup:	**5**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft
The deepest intrusive depth: **0** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered. **240** ***Score***

Future Use Activities

Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. ***Score***

Response Alternative No. 1: geophysical mapping, intrusive investigation, installation

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **3** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **0** ft

Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	**25**

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? — Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Temperatures of freezing or below occur regularly each winter and the frost line extends down to approximately

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.' ***Score***

Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

Select Ref(s)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Safety Buffer Areas'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: — Yes

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

UXO Special Case	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'UXO Special Case'. ***Score***

Baseline Conditions:	**180**
Surface Cleanup:	**180**
Subsurface Cleanup:	**180**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	OD Grounds-Kickout Area	a. Scoring Summary for Current Use Activities	
Date:	4/2/2012	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	715
		Hazard Level Category	3

Site ID:	OD Grounds-Kickout Area	b. Scoring Summary for Future Use Activities	
Date:	4/2/2012	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors			
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	380
		Hazard Level Category	4

Site ID:	OD Grounds-Kickout Area	c. Scoring Summary for Response Alternative 1: geophysical mapping, intrusive investigation, installation o	
Date:	4/2/2012	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Full Accessibility	80
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Safety Buffer Areas	5
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	25
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	445
		Hazard Level Category	4

Site ID:	OD Grounds-Kickout Area	d. Scoring Summary for Response Alternative 2:	
Date:	4/2/2012	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Safety Buffer Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		UXO Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

MEC HA Hazard Level Determination		
Site ID: OD Grounds-Kickout Area		
Date: 4/2/2012		
	Hazard Level Category	Score
a. Current Use Activities	3	715
b. Future Use Activities	4	380
c. Response Alternative 1: geophysical mapping, intrusive investigation, installation of cap, followed by implementation of	4	445
d. Response Alternative 2:		
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	No	
Are cultural resources located within the MRS or within the ESQD arc?	No	
Are significant ecological resources located within the MRS or within the ESQD arc?	No	

APPENDIX D

DETAILED COST ESTIMATE

Table D-1A
Summary of Costs for Alternative 2
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Total Labor Hours	Total Labor Budget	Total Subs, Equipment, and ODCs	Total Costs
Capital Costs				
Reporting	6,350	$572,550	$23,000	$595,550
Field Work	36,280	$2,538,300	$4,843,249	$7,381,549
Capital Costs Total	**42,630**	**$3,110,850**	**$4,866,249**	**$7,977,099**
Annual LTM				
LTM	187	$16,120	$4,995	$21,115
LUCs	64	$6,070	$4,300	$10,370
Annual LTM Costs Total	**251**	**$22,190**	**$9,295**	**$31,485**
Five Year Review	**372**	**$35,300**	**$5,000**	**$40,300**
Total Present Worth Cost[1]				**$8,856,000**

Note:
1. The total present worth cost includes a 5-Year Review, and the annual LTM and LUC review, with a discount rate of 2% over a 30 year interval.

Table D-1B
Labor Costs for Alternative 2
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Project Manager	Safety Manager	Site Manager	Engineer II	Engineer I	Sr. Geologist	Geophysicist	Drafter	Admin Support	SUXOS	UXO QC	UXOSO	UXO Tech I	UXO Tech II	UXO Tech III	Total Hours	Total Labor
	$140	$120	$100	$90	$80	$75	$80	$60	$55	$75	$67	$69	$46	$55	$66		
Reporting	**910**	**600**	**0**	**1,470**	**1,760**	**280**	**0**	**1,180**	**150**	**0**	**0**	**0**	**0**	**0**	**0**	**6,350**	**$572,550**
Work Plans	550	400	0	800	1,012	100	0	692	75	0	0	0	0	0	0	3,629	$331,105
Completion Report	360	200	0	670	748	180	0	488	75	0	0	0	0	0	0	2,721	$241,445
Field Work	**1,500**	**120**	**3,000**	**1,200**	**3,000**	**3,000**	**1,200**	**60**	**0**	**2,800**	**2,000**	**2,200**	**7,500**	**6,700**	**2,000**	**36,280**	**$2,538,300**
DGM/Intrusive Invest.	1,000	80	2,000	600	300	1,500	1,200	0	0	2,800	2,000	2,200	7,500	6,100	2,000	29,280	$1,944,400
Capping	500	40	1,000	600	2,700	1,500	0	60	0	0	0	0	0	600	0	7,000	$593,900
Excavation, T&D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0
LTM	**20**	**5**	**0**	**80**	**30**	**10**	**0**	**12**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**187**	**$16,120**
	20	5	0	80	30	10	0	12	30	0	0	0	0	0	0	187	$16,120
LUCs	**16**	**0**	**0**	**20**	**10**	**10**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**64**	**$6,070**
	16	0	0	20	10	10	0	8	0	0	0	0	0	0	0	64	$6,070
Total Hours	**2,446**	**725**	**3,000**	**2,770**	**4,800**	**3,300**	**1,200**	**1,260**	**180**	**2,800**	**2,000**	**2,200**	**7,500**	**6,700**	**2,000**	**42,881**	
Total Labor	**$342,440**	**$87,000**	**$300,000**	**$249,300**	**$384,000**	**$247,500**	**$96,000**	**$75,600**	**$9,900**	**$210,000**	**$134,000**	**$151,800**	**$345,000**	**$368,500**	**$132,000**		**$3,133,040**

Table D-1C
Equipment and ODC Costs for Alternative 2
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Quantity	Units	Unit Price	Total
Reporting				**$23,000**
Reproduction/Shipping	1	LS	$8,000	$8,000
Travel	1	LS	$15,000	$15,000
Field Work				**$1,595,770**
EM 61	55	/per unit/ mo	$1,774	$97,570
Radios	80	/per unit/ mo	$75	$6,000
Schonstedts	35	/per unit/ mo	$450	$15,750
Trimble	70	/per unit/ mo	$550	$38,500
Vehicles	50	/per unit/ mo	$900	$45,000
H&S equipment	2	LS	$10,000	$20,000
Office equipment	1	LS	$12,000	$12,000
Field materials (tape, flags, etc)	4	LS	$8,000	$32,000
Per Diem	6,700	/per day/per person	$146	$978,200
Kubota	10	/per unit/ mo	$1,575	$15,750
Tow Behind Magnet	1	LS	$35,000	$35,000
Other travel (mobilization/demobilization/site visits/meetings)	1	LS	$300,000	$300,000
LTM				**$4,995**
Reproduction and Binding	4400	/page	0.64	$2,816
Airfare	2	/trip	500	$1,000
Per Diem	8	/day	123	$984
Mileage	100	/mile	0.55	$55
Car	4	/day	35	$140
LUCs				**$4,300**
Reproduction/Shipping	1	LS	$800	$800
Travel	1	LS	$3,500	$3,500
Total				**$1,628,065**

Table D-1D
Subcontractor Costs for Alternative 2
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Quantity	Units	Unit Price	Total
Reporting				**$0**
Field Work				**$3,247,479**
Brush Clearing	1	LS	$210,500	$210,500
UXO				$655,890
UXO Tech III and associated equipment	229.0	per day	$1,092	$250,022
Mob/demob for UXO Tech III and equipment	17.0	per event	$1,962	$33,357
UXO Tech II and associated equipment	229.0	per day	$990	$226,671
Mob/demob for UXO Tech II and equipment	17.0	per event	$1,962	$33,357
Project Management	58.0	per week	$278	$16,130
Per event explosives	58.0	per event	$862	$50,002
Per event, delivery of explosives and related materials	19.0	per event	$1,125	$21,370
4x4 Truck and fuel	58.0	per week	$407	$23,597
Mob/demob for 4x4 truck	17.0	per event	$81	$1,383
Scrap Disposal	1	LS	$37,200	$37,200
Scrap < 31 mm	45	ton	$250	$11,250
Scrap > 31 mm	12	ton	$600	$7,200
Transportation	5	per event	$2,000	$10,000
Documentation	5	per event	$1,750	$8,750
Surveyor	1	LS	29000	$29,000
Analytical	290	per sample	$120	$34,800
Geotech	1,125	per sample	$200	$225,000
Hydroseeding	1	LS	$55,000	$55,000
Earthwork				$1,307,000
Excavation	83,800	cy	$15	$1,257,000
Site prep/maintenance (e.g., haul road, restoration, erosion controls)	1	LS	$50,000	$50,000
LTM				**$0**
LUCs				**$0**
Total				**$3,247,479**

Table D-2A
Summary of Costs for Alternative 3
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Total Labor Hours	Total Labor Budget	Total Subs, Equipment, and ODCs	Total Costs
Capital Costs				
Reporting	6,350	$572,550	$23,000	$595,550
Field Work	67,350	$4,684,700	$22,272,035	$26,956,735
Capital Costs Total	**73,700**	**$5,257,250**	**$22,295,035**	**$27,552,285**
Annual LUC Inspections	**69**	**$6,470**	**$4,300**	**$10,770**
Five Year Review	**372**	**$35,300**	**$5,000**	**$40,300**
Total Present Worth Cost[1]				**$27,967,000**

Note:
1. The total present worth cost includes a 5-Year Review, and the annual LUC review, with a discount rate of 2% over a 30 year interval.

Table D-2B
Labor Costs for Alternative 3
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Project Manager	Safety Manager	Site Manager	Engineer II	Engineer I	Sr. Geologist	Geophysicist	Drafter	Admin Support	SUXOS	UXO QC	UXOSO	UXO Tech I	UXO Tech II	UXO Tech III	Total Hours	Total Labor
	$140	$120	$100	$90	$80	$75	$80	$60	$55	$75	$67	$69	$46	$55	$66		
Reporting	**910**	**600**	**0**	**1,470**	**1,760**	**280**	**0**	**1,180**	**150**	**0**	**0**	**0**	**0**	**0**	**0**	**6,350**	**$572,550**
Work Plans	550	400	0	800	1,012	100	0	692	75	0	0	0	0	0	0	3,629	$331,105
Completion Reports	360	200	0	670	748	180	0	488	75	0	0	0	0	0	0	2,721	$241,445
Field Work	**2,200**	**200**	**5,200**	**5,100**	**4,800**	**4,300**	**1,250**	**0**	**0**	**5,800**	**2,200**	**5,200**	**15,500**	**10,600**	**5,000**	**67,350**	**$4,684,700**
DGM/Intrusive Invest.	1,000	80	2,000	600	300	1,500	1,200	0	0	2,800	2,000	2,200	7,500	6,100	2,000	29,280	$1,944,400
Capping	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0
Excavation, T&D	1,200	120	3,200	4,500	4,500	2,800	50	0	0	3,000	200	3,000	8,000	4,500	3,000	38,070	$2,740,300
LTM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**$0**
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	$0
LUCs	**16**	**0**	**0**	**20**	**15**	**10**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**69**	**$6,470**
	16	0	0	20	15	10	0	8	0	0	0	0	0	0	0	69	$6,470
Total Hours	**3,126**	**800**	**5,200**	**6,590**	**6,575**	**4,590**	**1,250**	**1,188**	**150**	**5,800**	**2,200**	**5,200**	**15,500**	**10,600**	**5,000**	**73,769**	
Total Labor	**$437,640**	**$96,000**	**$520,000**	**$593,100**	**$526,000**	**$344,250**	**$100,000**	**$71,280**	**$8,250**	**$435,000**	**$147,400**	**$358,800**	**$713,000**	**$583,000**	**$330,000**		**$5,263,720**

Table D-2C
Equipment and ODC Costs for Alternative 3
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Quantity	Units	Unit Price	Total
Reporting				**$23,000**
Reproduction/Shipping	1	LS	$8,000	$8,000
Travel	1	LS	$15,000	$15,000
Field Work				**$2,217,675**
EM 61	100	/per unit/ mo	$1,774	$177,400
Radios	155	/per unit/ mo	$75	$11,625
Schonstedts	110	/per unit/ mo	$450	$49,500
Trimble	105	/per unit/ mo	$550	$57,750
Vehicles	120	/per unit/ mo	$900	$108,000
H&S equipment	3	LS	$10,000	$30,000
Office equipment	1	LS	$12,000	$12,000
Field materials (tape, flags, etc)	4	LS	$8,000	$32,000
Per Diem	9,000	/per day/per person	$146	$1,314,000
Kubota	32	/per unit/ mo	$1,575	$50,400
Tow Behind Magnet	1	LS	$35,000	$35,000
Other travel (mobilization/demobilization/site visits/meetings)	1	LS	$300,000	$300,000
Demo	2	LS	$20,000	$40,000
LTM				**$0**
Reproduction and Binding		/page	0.64	$0
Airfare		/trip	500	$0
Per Diem		/day	123	$0
Mileage		/mile	0.55	$0
Car		/day	35	$0
LUCs				**$4,300**
Reproduction/Shipping	1	LS	$800	$800
Travel	1	LS	$3,500	$3,500
Total				**$2,244,975**

Table D-2D
Subcontractor Costs for Alternative 3
Feasibility Study Report - OD Grounds
Seneca Army Depot Activity

Description	Quantity	Units	Unit Price	Total
Reporting				**$0**
Field Work				**$20,054,360**
Brush Clearing	1	LS	$210,577	$210,577
UXO				
UXO Tech III and associated equipment	409.5	per day	$1,092	$447,092
Mob/demob for UXO Tech III and equipment	33.5	per event	$1,962	$65,732
UXO Tech II and associated equipment	409.5	per day	$990	$405,335
Mob/demob for UXO Tech II and equipment	32.3	per event	$1,962	$63,377
Project Management	104.6	per week	$278	$29,089
Per event explosives	123.4	per event	$862	$106,384
Per event, delivery of explosives and related materials	25.6	per event	$1,125	$28,794
4x4 Truck and fuel	103.6	per week	$407	$42,150
Mob/demob for 4x4 truck	32.3	per event	$81	$2,628
Scrap Disposal				
Scrap < 31 mm	45	ton	$250	$11,250
Scrap > 31 mm	12	ton	$600	$7,200
Transportation	5	per event	$2,000	$10,000
Documentation	5	per event	$1,750	$8,750
Surveyor	1	LS	$4,000	$4,000
Analytical	400	Per sample	$120	$48,000
Geotech	0	Per sample	$0	$0
Hydroseeding	0	LS	$0	$0
Earthwork				
Excavation	160,000	cy	$15	$2,400,000
Sifting	160,000	cy	$50	$8,000,000
Site prep/maintenance (e.g., haul road, restoration, erosion controls)	1	LS	$100,000	$100,000
T&D	268,800	ton	$30	$8,064,000
LTM				**$0**
LUCs				**$0**
Total				**$20,054,360**

APPENDIX E

RESPONSE TO COMMENTS

Army's Response to Comments from the United States Environmental Protection Agency

Subject: Draft Final Feasibility Study Report
Munitions Response Action at Open Detonation Grounds
Seneca Army Depot
Romulus, New York

Comments Dated: July 8, 2013

Date of Comment Response: February 27, 2015

<u>Army's Response to Comments</u>

GENERAL COMMENTS

Comment 1. Evaluation of the Response to General Comment 2: The response to General Comment 2 is inadequate. A baseline human health risk assessment (BHHRA) and baseline ecological risk assessment (BERA) have not been proposed to evaluate potential risks associated with munitions constituents (MC) detected at the site and the rationale provided for not assessing risks associated with MC is inadequate. While the risks posed by material potentially presenting an explosive hazard (MPPEH) is currently driving the need for a remedial action at the site, it is important to determine whether any chemical exposure risk needs to be addressed for current or future potential receptors (both human and ecological) exposed to MC in site media, particularly for those areas outside the proposed cap or excavation boundaries or posed by media that are not addressed by these proposed remedies. As stated in 40 CFR 300.430(d)(4), a site-specific baseline risk assessment shall be used "to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain. The results of the baseline risk assessment will help establish acceptable exposure levels for use in developing remedial alternatives in the FS."

In addition, the response to this comment suggests that metals in soil are the only possible chemicals of concern in media at this site. Unless a more thorough risk evaluation is conducted, it is unclear if additional media or chemicals need to be considered during evaluation of remedial alternatives. Section 1.3.1, Soil, notes that 2,4-dinitrotoluene and Aroclor-1254 were detected above screening criteria in soil at the site in addition to the metals previously noted; Section 1.3.2, Groundwater, identifies metals, two explosives, and one semi-volatile organic compound (SVOC) in groundwater; Section 1.3.3, Surface Water, notes that metals and nitroaromatics were detected in surface water; and Section 1.3.4, indicates that metals were detected in sediment. A BHHRA and BERA are warranted to determine potential risks to human health or the environment posed by these contaminants.

Response 1: A human health risk assessment was developed and is included in the FS as (Appendix B. A summary of the HHRA is presented in Section 1.5.

As discussed in the Technical Memo dated August 27, 2013, 2,4-DNT and Aroclor-1254 were not determined to be pervasive contaminants within the OD Grounds soil. Metals in the soil, specifically within the 0-500 foot radius, were determined to be the COCs.

A total of ninety-seven soil samples (92 surface soil and five subsurface soil) were collected and analyzed for inorganic metals [2013 Draft Final FS Report, Figures 1-5A and 1-5B show the locations of the soil samples collected at the OD Grounds. A summary of surface and subsurface soil exceedances are presented in Table 1-1.]. 70 samples were collected within the 500 foot OD Hill radius. The remaining 27 samples were collected between 500 and 2000 feet (Kickout Area) from the OD Hill to delineate the extent of any impacts to the surface soil within the Kickout Area. Forty-seven samples (42 surface and 5 subsurface) were collected and analyzed for explosives and thirty-five samples (30 surface, 5 subsurface) were analyzed for SVOCs, herbicides, pesticides, and PCBs. Sixteen samples were analyzed for VOCs. None of the VOCs, herbicide, or explosive results exceeded their respective screening criteria (November 2012, EPA Regional Screening Levels (RSL) for industrial soil and the NYSDEC approved Remedial Program Soil Cleanup Objectives (EPA, 2012; NYSDEC, 2013a). 6 NYCRR Subpart 375-6, effective December 2006).

The SVOC concentrations were all below the Commercial SCOs; however, one result from the SVOC analysis was an explosive, 2,4-dinitrotoluene, which reported a concentration (14,000 µg/kg) that exceeded its respective industrial RSL (5,500 µg/kg) (a corresponding SCO value is not available) in one sample. This sample (TP45-2) was collected at a location on top of OD Hill. However, using the appropriate analytical method for explosive analysis, the same sample resulted in a concentration of 190 µg/kg. Also, this was the only exceedance of the RSL for 2,4-DNT in the SVOC results. The maximum concentration of 2,4-DNT detected using the explosive analytical method was 1,100 µg/kg (S45-ODH-18-01). This value is below both the industrial RSL and the residential RSL of 1,600 µg/kg. Other nearby detections of 2,4-DNT were well below applicable screening criteria; therefore, the Army does not believe that the site was impacted by 2,4-DNT and it is not considered a contaminant of concern. The OD Hill area will be addressed by one of the remedial alternatives proposed in the FS, and any elevated concentrations in the soil would be addressed at that time.

The concentration of one PCB, Aroclor-1254, exceeded both its commercial SCO and industrial RSL screening criteria in one sample. The elevated concentration of Aroclor-1254 appears to be an isolated occurrence. Aroclor-1254 was detected at two soil sample locations. The maximum concentration (2,000 µg/kg) of Aroclor-1254 was detected in the surface soil sample S45-ODH-4-01 located on the eastern side of the OD Hill. This concentration is above the NYS Commercial SCO value of 1,000 µg/kg. The second detection of Aroclor-1254 in the surface soil was observed in the sample duplicate collected at SS45-10 at an estimated concentration of 110 J µg/kg, below the commercial SCO; Aroclor-1254 was not detected in the duplicate's associated sample. Aroclor-1254 was not detected in the subsurface soil or in groundwater. Based on the fact that the PCB was not detected in any other samples on or surrounding the OD Hill, and groundwater sampling has confirmed that the PCB has not migrated to groundwater, Aroclor-1254 is not considered a constituent of concern.

Among the metals, cadmium, copper and mercury were the only metals to exceed their respective Commercial SCOs. Arsenic, cadmium, and lead exceeded their respective industrial RSLs. Analytical soil data demonstrate that concentrations of metals are higher closer to the OD Hill, and concentrations decrease as the distance increases from the OD Hill and into the Kickout area of the OD Grounds. This is illustrated in Draft Final FS, Figures 1-6A and 1-6B. There were no exceedances of NYSDEC Commercial SCOs in the Kickout area.

Comment 2. Evaluation of the Response to General Comment 3: The response to General Comment 3 is partially adequate; however, additional clarification is necessary. As noted in the response, the definition of a commercial land use category by the New York State Department of Environmental Conservation (NYSDEC) includes "passive recreational uses, which are public uses with limited potential for soil contact." Since the anticipated future land use of the OD Grounds is for conservation/recreation purposes, the types of recreation that are anticipated should be identified to ensure that they constitute "passive recreational uses" so that application of the commercial land use criteria are adequately protective. The response also states that activities such as "camping or digging" will not be allowed at the site, yet Section 4.2.1.1, Overall Protection of Human Health and the Environment, of the Draft Final FS notes that "campers" are anticipated future recreational users at this site. Please provide further clarification of the anticipated future activities at the site in support of the identification of the NYSDEC Soil Cleanup Objectives (SCOs) for a commercial use scenario as the most relevant and appropriate criteria for the site. In addition, please ensure that the future anticipated activities at the site are consistently documented throughout the Response to Comments and Draft Final FS.

Response 2: The text was updated in Section 1.2.2 to describe passive recreational uses. "*The planned future use for OD Grounds is for conservation and passive recreational purposes where there is a limited potential for soil contact.*" The report was checked for consistency. The mention of "campers" in Section 4.2.1.1 was removed.

Comment 3. Evaluation of the Response to General Comment 4: The response to General Comment 4 is inadequate. The nature and extent of MC in surface soil, subsurface soil, sediment, surface water, and groundwater at the OD Grounds has not been sufficiently characterized. Examples of outstanding data gaps in the characterization of MC are identified below:

Bullet 1: Aroclor 1254 was detected above the NYS SCO for commercial use in surface soil sample S45-ODH-4-01, but the vertical and lateral extent of this contamination has not been delineated. According to Table A-1, Analytical Data for Surface and Subsurface Soil Samples at OD Grounds, in Appendix A, the closest sample to this location (S45-R1-04), as shown on Figure 1-5B, Historic Soil Sample Locations at OD Grounds (OD Hill Area), was not analyzed for polychlorinated biphenyls (PCBs). In addition, no subsurface soil samples appear to have been collected at S45-ODH-4-01, which reported the initial exceedance in surface soil. Additional sampling to delineate the lateral and vertical extent of this contamination appears warranted. Please revise the FS to clarify how this data gap will be addressed.

Response Bullet 1: The concentration of one PCB, Aroclor-1254, exceeded both its commercial SCO and industrial RSL screening criteria in one sample. The elevated concentration of Aroclor-1254 appears to be an isolated occurrence. Aroclor-1254 was detected at two soil sample locations. The maximum concentration (2,000 µg/kg) of Aroclor-1254 was detected in the surface soil sample S45-ODH-4-01 located on the eastern side of the OD Hill. This concentration is above the NYS Commercial SCO value of 1,000 µg/kg. The second detection of Aroclor-1254 in the surface soil was observed in the sample duplicate collected at SS45-10 at an estimated concentration of 110 J µg/kg, below the commercial SCO; Aroclor-1254 was not detected in the duplicate's associated sample. Aroclor-1254 was not detected in the subsurface soil or in groundwater. Based on the fact that the PCB was not detected in any other samples on or surrounding the OD Hill and groundwater sampling has confirmed that the PCB has not migrated to groundwater, Aroclor-1254 is not considered a constituent of concern. Additionally, the sample location is expected to be covered by an impervious cap preventing any further potential migration.

Bullet 2. 2,4-dinitrotoluene was detected in subsurface soil sample TP45-2 at a concentration greater than the industrial Regional Screening Level (RSL) (no NYS SCO has been established), but the extent of this contamination has not been delineated. According to Table A-1, Analytical Data for Surface and Subsurface Soil Samples at OD Grounds, of Appendix A, the closest surface soil sample to this location (S45-R1-02), as shown on Figure 1-5B, Historic Soil Sample Locations at OD Grounds (OD Hill Area) was not analyzed for SVOCs or explosives so it is unknown if surface impacts exist. Please revise the FS to clarify how the extent of 2,4-dinitrotoluene contamination will be adequately delineated.

Response Bullet 2: The SVOC concentrations were all below the Commercial SCOs; however, one result from the SVOC analysis was an explosive, 2,4-dinitrotoluene, which reported a concentration (14,000 µg/kg) that exceeded its respective industrial RSL (5,500 µg/kg) (a corresponding SCO value is not available) in one sample. This sample (TP45-2) was collected at a location on top of OD Hill. However, using the appropriate analytical method for explosive analysis, the same sample resulted in a concentration of 190 µg/kg. Also, this was the only exceedance of the RSL for 2,4-DNT in the SVOC results. The maximum concentration of 2,4-DNT detected using the explosive analytical method was 1,100 µg/kg (S45-ODH-18-01). This value is below both the industrial RSL and the residential RSL of 1,600 µg/kg. Other nearby detections of 2,4-DNT were well below applicable screening criteria; therefore, the Army does not believe that the site was impacted by 2,4-DNT and it is not considered a contaminant of concern. The OD Hill area will be addressed by one of the remedial alternatives proposed in the FS, and any elevated concentrations in the soil would be addressed at that time.

Bullet 3. Figure 1-4, Sediment, Surface Water, and Monitoring Well Locations at the OD Grounds, shows numerous Major Drainage Pathways, as designated by the green dashed lines on the figure, but very few of these drainages appear to have been sampled. These drainage ways may represent areas with higher concentrations of contaminants due to lateral migration of potentially impacted soil and sediment during storm events. Additional sampling of these drainage ways appears warranted. Please revise the FS to address this data gap.

Response Bullet 3: The surface water samples were collected from drainage swales that were typically dry and the water sampled likely represented surface runoff from a recent precipitation event, rather than site surface water. The four surface water samples collected were from ephemeral drainage ditches and a low-lying swale. These on-site surface water pools are not classified by NYSDEC as surface water bodies and therefore NY Ambient Water Quality Concentrations (AWQC) do not apply. Surface water is not considered a media of concern.

Bullet 4. It is unclear if surface water and sediment have been evaluated adequately at the OD Grounds. Figure 1-4, Sediment, Surface Water, and Monitoring Well Locations at the OD Grounds, shows numerous surface water and sediment sampling locations, but data from only four surface water/sediment sampling locations have been provided in Appendix A, Table A-3, Analytical Results for Surface Water Samples, and Table A-4, Analytical Results for Sediment Samples at OD Grounds. In addition, the analytical results from the Reeder Creek samples do not appear to have been provided. Please revise the FS to present a more thorough discussion of the nature and extent of contamination in surface water and sediment, supplemented with data summary tables for all applicable samples.

Response Bullet 4: Surface water and sediment results from previous reports will be included in the FS. Reeder Creek is the only recognized surface water body within the OD Grounds. No significant impacts to the surface water or sediment in Reeder Creek were found by previous studies. Any contaminated sediment associated with Reeder Creek was removed during the Seneca OB Grounds remediation (Weston, 2005). Refer to the Technical Memo for further detail.

Bullet 5. Shallow subsurface soil at the site has not been adequately characterized. According to Table A-1, Analytical Data for Surface and Subsurface Soil Samples at OD Grounds, only six soil samples were collected at depths greater than 0.5 (ft) feet below ground surface (bgs) (TP45-1, TP45-11, TP45-2, TP45-3, TP45-4, and TP45-5.) All six of these subsurface soil samples were collected at 3 ft bgs. Section 1.2.6.3, 2003 Phase I Geophysical Investigation, indicates that the majority of excavated anomalies from the 2003 investigation were found at depths of up to 12 inches bgs, with none exceeding 20 inches bgs. Shallow subsurface soil samples should be collected at similar depths to evaluate potential impacts from MC. Please revise the FS to address this data gap.

Response Bullet 5: Other than metals, impacts by other COCs were not found in the subsurface soil samples collected. Locally, groundwater was determined to not be a media of concern. Subsurface soil will be either excavated and the excavated surface sampled prior to emplacement of a cap or confirmatory samples will be taken prior to emplacement of a cap.

Bullet 6. The extent of metals contamination has not been well delineated in the northeast and southeast quadrants within the 500-foot radius from the OD Hill center point, as minimal sampling appears to have been conducted in these areas (Figure 1-6A, Metals Exceedances in Soil at the OD Grounds). Please revise the FS to address this apparent data gap.

Response Bullet 6: Subsequent to the RA selected for the 0 to 500-foot radius, confirmatory samples will be collected and the northeast and southeast quadrants will be further delineated. Soil within this radius is expected to be included under the cap. Soil outside the cap will be tested for compliance.

Bullet 7. Groundwater at the OD Grounds monitoring wells has not been sampled or gauged since 1995. Two explosives, one SVOC, and numerous metals were detected in groundwater during the 1995 assessment. Section 1.3.2, Groundwater, indicates the elevated metals results were attributed to turbid samples from the sampling methodology utilized; however, this conclusion should be confirmed with a more recent round of groundwater data. Groundwater samples should be collected using low-flow methodology to minimize the potential impact of turbidity.

Response Bullet 7: Between 2007 and 2012, LTM of wells within the OB Grounds for copper and lead has shown no evidence of lead or copper in the groundwater above the cleanup goals subsequent to the completion of the remedial action for the Site. These findings are consistent with the groundwater analytical results obtained during the RI stage (1990s) of work at the Site, indicating that there is no evidence of groundwater quality deterioration over approximately 20 years.

Bullet 8. It does not appear that any soil samples were analyzed for dioxins/furans based on the analytical descriptions in Section 1.2.6, Previous Investigations and Activities, as well as the response to this comment. Given the nature of activities at the site and the potential for the generation of dioxins/furans as a result of open burning/detonation activities, additional samples should be collected for these constituents to ensure an adequate dioxin/furan data set for site characterization and risk assessment, regardless of the sampling conducted at SEAD-23.

Response Bullet 8: Dioxin and furan testing was not considered as part of the confirmation testing program for this site. The precedence set at SEAD-23 was used as the basis for testing requirements here since the entire SEAD-23 is wholly within this site. The Army did not expect to be required to reopen the previously agreed on conditions and considered them as an acceptable basis for the remedial action proposed.

Response 3: The FS was addressed as per above responses. Additional data tables regarding historical soil, sediment, and groundwater samples referenced in the text were provided in the Technical Memo.

Comment 4. Evaluation of the Response to General Comment 6: The response to General Comment 6 is inadequate. The Draft Final FS still uses inconsistent screening criteria to evaluate site sediment data. Table 1-4, Summary of Sediment Data, identifies the NYSDEC Commercial SCOs (6 NYCRR Subpart

375-6) as the applicable screening criteria for sediment whereas Table A-4, Analytical Results for Sediment Samples at OD Grounds, of Appendix A compares sediment data to the NYS SCO Unrestricted Use values. In addition, while the NYSDEC Commercial SCOs may be applicable to the site pending additional clarification of future activities at the site (i.e. types of recreation), the sediment data should also be compared to appropriate ecological screening criteria. Please revise the Draft Final FS to compare the sediment data to consistent screening criteria throughout the text, tables, and appendices. Further, please compare the sediment data to appropriate ecological screening values.

Response 4: There is no expected residential use of any type (even with restrictions) due to the past use of the site as an OB/OD range and the planned future use of the land for conservation/recreation. As a conservative measure, the Army did consider the application of the Restricted Residential SCO; however, this objective was not appropriate since no type of residential use will be permitted at the site. The screening criteria presented in Table A-4 will be corrected to be consistent with Table 1-4. Any contaminated sediment in Reeder Creek was removed during the Seneca OB Grounds remediation (Weston, 2005). The sample results presented in the previous version of Table 1-4/A-4 are more representative of soil, as the samples were collected from drainage ditches. This sample medium is referred to as the 'ditch soil' in the FS, tech memo, and HHRA. Table 1-4 was renamed Table 1-2 (Summary of Ditch Soil Data). Table A-4 was revised to reflect Ditch Soil. Both tables use NYSDEC Commercial SCOs as screening criteria.

Comment 5. Evaluation of the Response to General Comment 7: The response to General Comment 7 is partially adequate. Section 2.5, General Response Actions, of the Draft Final FS has been revised to identify general response actions (GRAs) potentially applicable to the site; however, narrative discussion of these GRAs is limited to the "No Action" GRA and the "Hazard Management – LUCs" GRA. A discussion of each general response action as part of the "Remedial Action" category has not been included in Section 2.5. Please revise Section 2.5 to include a narrative discussion of each GRA included in the "Remedial Action" category.

Table 2-2, OD Grounds Feasibility Study – Technology Screening, should not include land use controls (LUCs) as both a subcategory of the Hazard Management GRA and the Remedial Action GRA. Hazard Management/LUCs should be defined as its own GRA, and institutional controls and engineering controls should be identified as the "Primary Remedial Technologies" as categories of this GRA. Please revise Table 2-2 to make this change.

Response 5: Further information regarding the "Remedial Action" category was added to Section 2.5.

> A remedial action alternative employs engineered approaches to reduce the toxicity, mobility, or volume (TMV) of contaminants in the subsurface, thereby preventing or minimizing exposure of receptors to MEC or chemical contamination that could pose an unacceptable MEC hazard or MC risk. Physical extraction methods are typically used to remove surface and subsurface MEC for disposal. The feasibility and cost to implement MEC excavation options can vary widely based on site-specific conditions and circumstances.

Further detail of each GRA is provided in Section 2.6.

Land use controls were removed from the Remedial Action GRA category in Table 2.2. Institutional and engineering controls were identified as primary remedial technologies.

Comment 6. Evaluation of the Response to General Comment 9: The response to General Comment 9 is partially adequate. While estimates of the excavation volume and cap size have been provided, the basis for these estimates is largely undefined. Without sufficient data to support these estimates, the evaluation criteria for each alternative cannot be consistently applied and order-of-magnitude cost estimates, having an accuracy of +50 percent to -30 percent, cannot be provided with any reasonable certainty. It is noted that Munitions and Explosives of Concern (MEC) activities are currently being conducted at the site. In addition, significant data gaps in the investigation of MC at the site have been identified. The data obtained from the MEC activities and any future MC characterization activities to address data gaps may provide valuable information to inform the FS process. It is therefore suggested that the final FS be postponed until additional data from the MEC and suggested MC characterization activities are collected and evaluated to better define the scope of the FS.

Response 6: During the development of alternatives within the FS, the estimate for the excavation volume and cap size are presented. More detailed information will be presented in a Remedial Design Work Plan which would provide more exact dimensions. All additional information on MEC characterization at the site will be provided in the Closure Report and will be used to inform the actual design work plan. Refer to response to Comment 1 for information regarding MC data gaps.

Comment 7. Evaluation of the Response to General Comment 10: The response to General Comment 10 is inadequate. Very little additional detail has been added to Section 4.0, Detailed Analysis of Retained Alternatives. The evaluation of each of the alternatives does not adequately address all aspects of the nine evaluation criteria as presented in the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (October 1988, EPA/540/G-89/004) (RI/FS Guidance). For example, for an evaluation of short term protectiveness, the FS should discuss the protection of the community during remedial actions, protection of workers during remedial actions, environmental impacts during implementation of the remedial action, and the time until remedial action objectives are achieved. Please review Figure 6-2, Criteria for Detailed Analysis of Alternatives, of the RI/FS Guidance for information on what specific aspects of each of the criteria should be addressed.

Response 7: Additional detail was added to Sections 4.3.2.2 and 4.3.3.2 regarding the additional criteria provided in the RI/FS Guidance. Section 4.3.2.2 as follows:

> This is a long-term solution as long as the cap is maintained and appropriate LUCs are emplaced. During remedial actions, the community is shielded from construction activities by security measures already in place at the site. The protection of site workers will be ensured by using trained UXO personnel and by providing other personnel with UXO Technician escorts.

Section 4.3.3.2 was updated as follows:

> This is a long-term solution as both the MEC source and any soil identified outside of appropriate screening criteria would be removed. During remedial actions, the community is shielded from

> construction activities by security measures already in place at the site. The protection of site workers will be ensured by using trained UXO personnel and by providing other personnel with UXO Technician escorts. The environment would be protected during excavation activities by using the proper construction best management practices.

Comment 8. Evaluation of the Response to General Comment 11: The response to General Comment 11 is partially adequate. Some revisions to the Comparative Analysis of Alternatives in Section 4.4 have been made; however, ambiguity remains when determining the overall ranking of the alternatives within each category as well as when identifying significant distinctions among the alternatives. For example, Section 4.4.4, Reduction of Toxicity, Mobility, or Volume Through Treatment, describes what Alternative 3 offers, what Alternatives 2 and 3 offer, and what Alternative 1 does not offer, but there is no clear indication of the alternative that performs best in this category.

In addition, Section 4.4.5, Short-Term Effectiveness, does not address the differences in the time needed to implement the remedies or the differences in worker or community protection afforded by the alternatives. Presenting additional details such as these may allow for further distinction among the alternatives. Please revise the comparative analysis to provide additional discriminating details for each of the alternatives within each category of evaluation. It is suggested that Table F-1, Individual Evaluation of Final Alternatives, Case Study, of the RI/FS Guidance be reviewed as an example of the level of detail necessary for a comparative analysis of alternatives.

Response 8: Additional text was added, where appropriate, within Sections 4.4.2 and 4.4.4 to address the best performing alternative in each category. Section 4.4.5 was updated to include further detail regarding the short-term effectiveness of each alternative as follows:

> No additional risk to the community, site workers, or the environment is provided by Alternative 1; however, Alternative 1 is determined to have the greatest risk and least short-term effectiveness due to no actions taken to remove the MPPEH and contaminated soil risk therefore a continued impact for existing conditions will persist.
>
> Locally, during implementation of Alternatives 2 and 3, a temporary increase in dust may be associated with cap installation and/or excavation; however, the local community is generally buffered from these activities due to the location of the site within SEDA. Both Alternative 2 and 3 would require UXO personnel who would be exposed to explosive hazards. Alternative 2 requires less excavation than Alternative 3 however both require the installation of a soil cap; therefore, protection would be required against dermal contact and dust inhalation during construction activities.
>
> Both Alternative 2 and 3 would provide similar short-term effectiveness in a similar amount of time (i.e., months). Alternatives 2 and 3 include demolition of recovered MPPEH thus reducing the explosive hazard at the site. Alternative 3, which includes off-site transportation and disposal, has a short-term negative impact of hauling materials on public roads outside of the Depot, which can impact the surrounding community.

Comment 9. Evaluation of the Response to General Comment 12: The response to General Comment 12 is partially adequate. It appears that the cost estimates have been revised to utilize a 2% discount rate; however, Section 4.2.2.5, Cost, of the Draft Final FS still indicates that a 7% discount rate was utilized. Please revise Section 4.2.2.5 to identify the 2% discount rate utilized for the evaluation.

Response 9: The text in Section 4.2.2.5 was corrected.

Comment 10. Evaluation of the Response to General Comment 13: The response to General Comment 13 is partially adequate. While some additional detail has been provided for the cost estimates, many of the lump sum costs included in the detailed cost estimates have not been substantiated. For example, as noted in the original General Comment 13, Table C-1C, Equipment and ODC Costs for Alternative 2, of Appendix C, Detailed Cost Estimate, included a $300,000 estimate for "Other travel" without describing the basis for the estimate.

The Draft Final FS still does not include a breakdown of costs associated with "Other travel." A lump sum cost for hydroseeding ($55,000) has also been added to Table C-1D, Subcontractor Costs for Alternative 2, but the assumptions inherent in this estimate have not been provided (cost per acre, number of acres requiring hydroseed, etc.). Revise the Draft Final FS to ensure all assumptions used in the cost estimates for all of the alternatives evaluated are noted and substantiated. In addition, as previously noted in original General Comment 13, but not addressed in the response or Draft Final FS, all acronyms and abbreviations used in the Appendix C tables should be defined within the tables.

Response 10: The costs presented in the FS are estimates based on the currently available data. Other travel includes activities such as field mobilization/demobilization, site visits, and meetings. As stated in the RI/FS Guidance:

> Typically, alternatives will have been defined well enough before screening that some estimates of cost are available for comparisons among alternatives. However, because uncertainties associated with the definition of alternatives often remain, it may not be practicable to define the costs of alternatives with the accuracy desired for the detailed analysis (i.e., +50 percent to -30 percent).
>
> Absolute accuracy of cost estimates during screening is not essential. The focus should be to make comparative estimates for alternatives with relative accuracy so that cost decisions among alternatives will be sustained as the accuracy of cost estimates improves beyond the screening process. The procedures used to develop cost estimates for alternative screening are similar to those used for the detailed analysis; the only differences would be in the degree of alternative refinement and in the degree to which cost components are developed.

Comment 11. Evaluation of the Response to General Comment 14: The response to General Comment 14 is partially adequate. The response notes that excavated soil will be staged on-site for potential re-use and/or incorporation under the site cap; however, this information has not been incorporated into all applicable sections of the Draft Final FS. The Executive Summary appears to have been revised appropriately, but Section 3.2.2, Alternative 2, Geophysical Mapping/Intrusive Investigation/Capping/ LUCs, of the Draft Final FS still states that overburden may be incorporated into the site cap, not placed under it. Please revise the Draft Final FS to consistently state, in all applicable sections, that excavated soil may be placed under the proposed cap and remove any reference to incorporating excavated soil into the cap.

Response 11: The document was scrubbed for consistency. Overburden may be placed under the cap. Sections 3.2.2 and 4.3.2.1 were updated to incorporate this change.

Army's Response to Comments from the New York State Department of Environmental Conservation

Subject: Draft Final Feasibility Study Report
Munitions Response Action at Open Detonation Grounds
Seneca Army Depot
Romulus, New York

Comments Dated: August 6, 2013

Date of Comment Response: February 27, 2015

Army's Response to Comments

GENERAL COMMENTS

Comment 1. Page E-2: Executive Summary – Please specify the appropriate Part 375 Soil Cleanup Objectives (SCOs) Category that the engineered cap will be adhering to.

Response 1. The engineered cap will adhere to Part 375.6-7 (d)(1)(ii)(b) for commercial use sites which use the lower of the protection of groundwater or the protection of public health soil cleanup objectives, for the identified use of the site as set forth in Table 375-6.8(b). As per Section 1.3.1 of the FS, commercial use SCOs were determined to be appropriate therefore the commercial value set forth in Table 375-6.8(b) will be used. The referenced paragraph was updated as follows: "*The cap will comply with applicable requirements of New York State (NYS) Part 360 requirements for leaving waste in-place and the applicable screening criteria outlined in Part 375.6-7 (d)(1)(ii)(b).*"

Comment 2. Page 1-8, Section 1.3.1 (Soil) – It is mentioned that the OD grounds is located in the future Conservation/Recreation area and that the NYSDEC SCOs for the Commercial Use scenario are considered to be appropriate criteria for the OD grounds. Because of the definition of commercial use, the site should not be used in cases where contact with the soil is likely. This would include, but is not limited to, playgrounds and ball parks. Hiking trails and scenic walk paths are considered acceptable. This language should be clarified throughout the document.

Response 2. The language in Section 1.3.1 was revised as requested. "*The OD Grounds is located in the future Conservation/Recreation area (Figure 1-3); however, the site should not be used for uses where contact with the soil is likely (e.g., playgrounds and ball parks). Hiking trails and scenic walk paths are considered acceptable.*"

Section 2.1 (1st paragraph) was clarified. "*The future use for the OD Grounds is passive recreation/conservation for walking and hiking activities. There will be no intrusive soil activities such as digging, camping, camp fires, tent staking, trail construction, playgrounds, etc.*"

Section 2.1 (5th paragraph, 2nd bullet) was revised. "…*would be for passive recreation/conservation where contact with the soil is not likely (i.e., would not include playgrounds, ballparks, camping).*"

Section 1.2.2 was clarified as follows: "*Passive recreation indicating a use of the land where there is a limited potential for soil contact (e.g, does not include playgrounds or ballparks, but would include hiking or nature trails).*"

Comment 3. Page 1-10, Section 1.3.2 (Groundwater) – On page 1-10, the metals in groundwater is likely due to high turbidity levels. In the future, filtered groundwater samples should be taken and be compared to unfiltered groundwater samples if the turbidity levels are high. This is to ensure that no metals were leached into the groundwater from the soil.

Response 3. Comment noted. Recent groundwater samples collected during LTM of the OB Grounds have had low turbidity values and have not needed field filtering; however, in the future, if turbidity levels become a concern, filtering of the samples will be discussed with the BCT as USEPA does not accept filtered samples unless there is agreement as to how the data will be used.

Comment 4. Page 1-11, Section 1.3.4 (Sediment) – The report stated that sediment samples are collected from drainage ditches (ditch soil) and low-lying areas. It is confusing to label these samples as sediment and then compare the results with the Part 375 Commercial SCOs since the State's Division of Fish and Wildlife has its own sediment screening criteria. A suggestion would be to change the title of the section to "Ditch Soil" or simply reorganize them under the Section 1.3.1 for Soils. A new Section for Sediments can be started in Page 1-12 for actual sediments collected from the Reeder Creek.

Response 4. The paragraph concerning "Ditch Soil" was moved to follow Section 1.3.1 – Soil and was named Section 1.3.2 – Ditch Soil. The groundwater, surface water and sediment sections were renumbered as appropriate. Section 1.3.5 – Sediment only included the historical results from the sediment collected in Reeder Creek.

Comment 5. Page 1-12, Section 1.3.4 (Sediment), Second Paragraph: It is stated that the sediment found in Reeder Creek was from 'decomposition of fallen leaves and tree material stockpiles…' Please explain why or how the levels of heavy metals were found in the sediment exceeding NY Sediment Criteria values. For instance, could these heavy metals be taken up by the roots of trees and released back to the environment upon decomposition? Or are these heavy metals part of the native makeup of the soils?

Response 5. The sampling results with heavy metals exceeding screening criteria in sediment from Reeder Creek were from samples collected in 1991/1992 (Parsons, 1994) at a time when sediment (i.e., sand and silt), in sufficient quantities to sample, was observed in the creek. Since the 1991/1992 sampling event, the sediment in the creek was removed as part of the OB Grounds remediation (Weston, 2005).

Recent (2014) observations of the bottom of Reeder Creek have noted that the stream bottom is composed mostly of bedrock or bedrock fragments with a thin veil of organic sediment and/or tree and leaf litter. These observations are consistent with previous annual inspections conducted in the past five years. Section 1.3.5 was clarified as follows:

> The streambed was observed to contain exposed bedrock and fractured shale pieces and thin organic/sediment layers which appear to be from decomposition of fallen leaves and the migration of tree material stockpiles by beavers in previous seasons and not the result of active erosion of the site soil and soil transport (Parsons, 2014).

Comment 6. Page 3-1, Section 3.0 (Alternatives), First Paragraph: The entire Section sometimes makes references to remediating munitions constituents (MC) but eliminates MC from the discussion in other write-ups. Please make it clear at the beginning of Section 3 if MC are being considered as part of the remedial goals. If MC's are part of the remedial goals, they need to be discussed in all the alternatives and/or screening criteria.

Response 6. The remedial actions evaluated in the FS are driven by the reduction of the hazard presented by the presence of MPPEH; however, both Alternatives 2 and 3 will address MC (e.g., heavy metals) at the site. MC levels will be remediated to comply with the proposed cleanup criteria.

Comment 7. Page 4-5, Section 4.3.2.1 (Description Alternative 2), Second Paragraph: "The soil will be screened to remove MPPEH, and the overburden will be staged on-site for potential reuse and/or incorporation into the site cap…" The concern over reusing the overburden as a site cap is that the MPPEH screening does not remove all the heavy metals in the soil. Per Section 1.3.1, the soil is found to exceed Commercial SCOs for cadmium, copper and mercury. This site cannot meet the Commercial SCOs for soil if the cap is taken from the same soil that contains heavy metals above the Commercial SCOs. Because of this, it is advised that the soil will have to be retested to ensure the compliance to Commercial SCOs after it has been screened for MPPEH, or an outside source meeting the soil Commercial SCOs should be used for the site.

Response 7. Overburden will be retested prior to reuse in the soil cap. A sufficient layer of cover soil which complies with NYSDEC SCOs will be emplaced over the reused overburden. Overburden will be used to shape the area to promote drainage and will be under the impervious layer. Any soil used as part of the actual cap will demonstrate compliance with the SCOs.