**DEPARTMENT OF THE AIR FORCE**
**AIR FORCE CIVIL ENGINEER CENTER**

633006

January 15, 2020

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DIV. OF ENVIRONMENTAL REMEDIATION

FROM: AFCEC/CIBE – Plattsburgh
8 Colorado Street, Suite 121
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SUBJECT: Final Supplemental Site Investigation Report Lot 69 Hazardous Waste Storage Area (SS017) Former Griffiss Air Force Base (AFB) Rome, New York January 2020

Accompanying this letter, please find following document for the former Griffiss AFB for your review and comment.

- *Final Supplemental Site Investigation Report Lot 69 Hazardous Waste Storage Area (SS017), Former Griffiss AFB Rome New York January 2020*

This report has incorporated all comments received from the USEPA. The NYSDEC provided concurrence on the draft via email on 9 December 2019.

Should you have any questions or concerns please contact me at 518-563-2871 or david.farnsworth@us.af.mil.

David S. Farnsworth
Program Manager/BRAC Environment Coordinator
BRAC Program Execution Branch

Attachments:
1. Final SS017 Supplemental Site Investigation Report
2. Distribution List

Distribution Requirements
Final Supplemental Site Investigation Report Lot 69 Hazardous Waste Storage Area (SS017)
Former Griffiss Air Force Base (AFB) Rome, New York
January 2020

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# FINAL

# SUPPLEMENTAL SITE INVESTIGATION REPORT
# LOT 69 HAZARDOUS WASTE STORAGE AREA (SS017)
# FORMER GRIFFISS AIR FORCE BASE
# ROME, NEW YORK

**January 2020**

Prepared For:




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Contract No: FA8903-16-F-0012
Project No: AFCGSA3.0012.00AC.2021.0002

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| % | Percent |
| AFB | Air Force Base |
| AFCEC | Air Force Civil Engineer Center |
| AOC | Area of Concern |
| bgs | Below ground surface |
| Bhate | Bhate Environmental Associates, Inc. |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| COPCs | Chemicals of potential concern |
| DPT | Direct push technology |
| FPM | FPM Group, Ltd. |
| ft | Foot or feet |
| HI | Hazard Index |
| HHRA | Human health risk assessment |
| HQ | Hazard Quotient |
| IC | Institutional Control |
| LUC | Land Use Control |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NYCRR | New York Codes, Rules, and Regulations |
| NYS | New York State |
| NYSDEC | New York State Department of Environmental Conservation |
| PAHs | Polycyclic Aromatic Hydrocarbons |
| PCBs | Polychlorinated biphenyls |
| PPRTV | Provisional Peer Reviewed Toxicity Values |
| QC | Quality control |
| RAGS | Risk Assessment Guidance for Superfund |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| RME | Reasonable maximum exposure |
| ROD | Record of Decision |
| RSL | Regional Screening Level |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| SCOs | Soil Cleanup Objectives |

| | |
|---|---|
| SI | Site Investigation |
| SIM | Selected Ion Monitoring |
| SVOCs | Semi-volatile Organic Compounds |
| TAL | Target Analyte List |
| TCE | Trichloroethene |
| UCL | Upper Confidence Limit |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| VOCs | Volatile Organic Compounds |

# 1 INTRODUCTION

Bhate Environmental Associates, Inc. (Bhate), conducted supplemental site investigation activities at Site SS017 (Lot 69 Hazardous Waste Storage Area) at the former Griffiss Air Force Base (AFB) in Rome, New York to support removal of the current Land Use Control (LUC)/Institutional Control (IC) restriction for non-residential use. Bhate has prepared this Site SS017 (Lot 69 Hazardous Waste Storage Area) Supplemental Site Investigation (SI) Report in accordance with Air Force Civil Engineer Center (AFCEC) Contract Number FA8903-16-F-0012. The objective of the Supplemental SI is to demonstrate that the non-residential use deed restriction can be removed from Site SS017 and that no cleanup of soils is required.

## 1.1 Purpose

This Supplemental SI Report has been prepared to present additional Site SS017 surface and subsurface soil sampling results from June 2017. Sampling was conducted at this site as a result of the Air Force's initiative to reduce its long-term environmental liabilities and the life cycle costs through site closures. This site is subject to a deed restriction in the form of land use restrictions for non-residential use. An evaluation of the site, including soil sampling, was conducted to determine if residual soil contamination meets the 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 Residential Use Soil Cleanup Objectives (SCOs) and to obtain closure with unrestricted reuse at the site based upon a baseline human health risk assessment (HHRA) conducted under the authority of the United States Environmental Protection Agency (USEPA), pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); the National Oil and Hazardous Substances Pollution Contingency Plan (the NCP) (USEPA, 1990); and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The goal of the baseline HHRA is to evaluate the cancer risks and non-cancer hazards to the Reasonably Maximally Exposed Individual. The reasonable maximum exposure (RME) is defined as the highest exposure that is reasonably expected to occur at a site. RMEs are estimated for individual pathways (USEPA, 1989 – Risk Assessment Guidance for Superfund (RAGS) Part A). The calculated cancer risks and non-cancer hazards resulting from this evaluation will be used to support decisions regarding whether the LUC can be removed from the Site based on the results of the Baseline HHRA. The baseline HHRA evaluated cancer risks and non-cancer health hazards in the absence of the current LUC/IC which prevents residential use of the Site. The Supplemental SI was conducted in accordance with the *Final Uniform Federal Policy - Quality Assurance Project Plan Supplemental Investigation at Sites SS017: Lot 69, DP022: Building 222, and SS025: T-9 Storage Areas Former Griffiss Air Force Base Rome, New York* (Bhate, February 2017).

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# 2 RECORD OF DECISION

The Record of Decision (ROD) for Site SS017 (Lot 69) (Air Force Base Conversion Agency, December 2004) was signed by the USEPA on March 17, 2005. In accordance with the ROD, ICs in the form of land use restrictions within the site boundaries for non-residential use and groundwater use restrictions were implemented. Based on elevated metal detections in groundwater being associated with suspended solids and consistent with background levels (FPM Group, Ltd. [FPM], November 2004), no further groundwater monitoring was recommended and monitoring ceased. Site SS017 (Lot 69) monitoring wells were decommissioned in the winter of 2008/2009. A request to remove the groundwater restriction under the ROD at the site was issued by the Air Force in March 2012 since no chemicals of concern were detected above New York State Department of Environmental Conservation (NYSDEC) Groundwater Standards at the Site. NYSDEC acceptance was provided on June 7, 2012, and USEPA acceptance was provided on October 15, 2012.

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# 3 SITE BACKGROUND

The following information was obtained from the *Final Project Management Plan Performance Based Remediation at Former Griffiss Air Force Base, New York* (CAPE, May 2011). Site SS017 (Lot 69) is located in the south central industrialized part of Griffiss AFB, east of the Building 20 site and bordered on the south side by Ellsworth Road (**Figures 1** and **2**). The Site SS017 (Lot 69) boundary is now occupied by a Vehicle Maintenance Facility, including Buildings 11 and 15, and a large asphalt paved area used for parking and equipment storage. As shown on **Figure 2,** the asphalt paved area covers approximately 70 percent (%) of the Site SS017 footprint. Site SS017 (Lot 69) currently houses a Birnie Bus maintenance facility.

From 1965 to 1982, Site SS017 (Lot 69) was an unfenced interim storage area for containers of liquid and solid hazardous wastes generated at the Base. A review of aerial photographs indicates the location of Building 11 was the original storage area. Wastes managed at the site included soot from No. 6 fuel oil, flammable liquids, spent corrosives, trap grease, spent solvents, neutralized acids, spent paint thinners, fuel spill residues, and waste oils. The drums were stored outside on raised pallets, and the storage area was diked. During the period of use, spills were reported to have occurred.

In 1982, when the present Vehicle Maintenance Facility was constructed and the site was paved, the stored wastes were relocated temporarily to a location designated as Lot 69 East (i.e., the area around Building 15). After approximately 6 months, the stored wastes were transferred to Lot 11. No spills were reported.

An analysis of soils was conducted in 1982 (sample locations unknown) indicating the presence of several organic contaminants including trichloroethene (TCE), toluene, xylenes, and polychlorinated biphenyls (PCBs). A Remedial Investigation (RI) was performed in 1994 (Law Engineering and Environmental Services, Inc., December 1996) to determine the nature and extent of contamination. The analyses of soil and groundwater included Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), pesticides, herbicides, PCBs, metals, petroleum hydrocarbons, and total cyanide. Five groundwater samples resulted in concentrations of alpha-BHC and six metals exceeding federal and/or NYSDEC Class GA groundwater standards. Subsurface soil samples reported exceedances of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, barium, and chrysene above New York State (NYS) recommended SCOs. During the 1994 SS017 RI, the eight soil borings were advanced through the asphalt parking lot to groundwater. The SS017 RI Report (Law Engineering and Environmental Services, Inc., December 1996) attributed the asphalt pavement as the source of the Polycyclic Aromatic Hydrocarbons (PAHs) detected in the shallow soil sample intervals (0 - 2 feet [ft] below ground surface [bgs]). Aroclor-1260 exceeded proposed Resource Conservation and Recovery Act (RCRA) corrective action levels and seven metals exceeded NYS background screening concentrations.

All contaminants detected in the soils and groundwater were considered chemicals of potential concern (COPCs), with the exception of a few inorganics (iron, magnesium, calcium, potassium, and sodium) deemed essential human nutrients, and selected for a baseline HHRA conducted during the RI (Law Engineering and Environmental Services, Inc., December 1996). The total carcinogenic risk to occupational workers (2 x 10-6) was within the risk range of 1 x 10-6 to 1 x 10-4 (one in a million to one in ten thousand). The potential exposures at Site SS017 (Lot 69 Hazardous Waste Storage Area) represent a risk that is within the risk range. The non-carcinogenic risk to occupational workers (ranging from 0.003 to 0.07) was below the goal of protection of a Hazard Quotient (HQ) or Hazard Index (HI) = 1 for every scenario with the exception of the potential risk to industrial workers from incidental ingestion of groundwater. Due to the highly developed area, no complete exposure pathways for ecological risk were identified. Therefore the results of the baseline risk assessment indicated that chemicals in soil do not present a risk to current and future occupational workers. It is important to note that residential land use was not evaluated in the 1996 risk assessment where only industrial land use was evaluated. A supplemental investigation was performed in 1997 (Ecology and Environment, Inc., July 1998) with additional groundwater testing. No compounds exceeded action levels.

# 4 SS017 SUPPLEMENTAL SITE INVESTIGATION

The Supplemental SI conducted by Bhate at Site SS017 (Lot 69) included surface and subsurface soil sampling to determine if residual soil contamination at the site is above 6 NYCRR Part 375 Residential Use SCOs. The soil sampling results were also evaluated to determine the cancer risks and non-cancer hazards under the Baseline HHRA to support decisions under CERCLA. The HHRA evaluated exposures to a future resident as described in Section 5 of this report.

Soil sampling, laboratory analysis, and data validation were performed in accordance with the *Final Uniform Federal Policy-Quality Assurance Project Plan Supplemental Investigation at Sites SS017: Lot 69, DP022: Building 222, and SS025: T-9 Storage Area Former Griffiss Air Force Base Rome, New York* (Bhate, February 2017), Worksheets 15, 28, and 36, respectively. Appropriate quality control (QC) samples were collected, submitted, and analyzed with the soil samples. QC samples included field duplicates, an ambient blank, and trip blanks. The Data Useability Spreadsheet (contained in Attachment 1, Appendix B) was used to evaluate the quality of data for use in the HHRA.

## 4.1 Soil Sampling

In early June 2017, 44 soil samples (including 4 duplicates) from 10 soil borings using direct push technology (DPT) and six surface soil samples were collected within the Site SS017 boundary (**Figure 3**). Surface soil samples were collected from 0 to 2 inches bgs and subsurface soil samples were collected in 2 ft increments from 0 ft bgs to the water table. As the 10 soil borings were advanced into or immediately adjacent to the asphalt paved parking lot area, the six surface soil samples (SS017-SS01, -SS03, -SS06, -SS07, -SS08, and –SS10) were collected in adjacent grassy areas 4 to 20 ft from their corresponding soil boring. It is important to note that four soil borings (SS017-SB02, -SB04, -SB05, and –SB09) were drilled in the central portion of the asphalt parking lot, and as a result, surface soil samples were not collected for these boreholes. **Appendix A** contains the 10 soil boring logs including the photoionization detector screenings and the depth to groundwater measurements at the time of drilling. The samples were analyzed for pesticides/PCBs (by USEPA Method SW8081/8082), PAHs (by USEPA Method SW8270D-Selected Ion Monitoring [SIM]), VOCs (by USEPA Method SW8260B), and Target Analyte List [TAL] metals (by USEPA Method SW6010C/7471A) and analyzed by TestAmerica Laboratory in Arvada, Colorado. Groundwater across the site varied from 5.5 ft bgs to 9.0 ft bgs. Due to recovery issues near the saturated soils from the sandy soils, samples were collected every 2 ft per the Work Plan but the limited soil in the interval that contained the saturated soils could not be sampled. In addition, one sample from 2 to 3 inches below vegetation or impervious surface was collected to assess human exposure to surface soil. The analytical results of the soil sampling activities are provided in **Table 1**. **Appendix B** contains the analytical laboratory results and **Appendix C** contains the data validation reports.

### 4.1.1 Surface Soil Sampling Results

A total of six surface soil samples were collected from 0 to 2-inches bgs. In an effort to prevent PAH impacts from asphalt, the six surface soil samples were collected from nearby grassy areas None of the surface soil samples exceeded the 6 NYCRR Part 375 Residential Use SCOs for all analyzed VOCs, PAHs, pesticides, PCBs, and TAL metals.

### 4.1.2 Subsurface Soil Sampling Results

A total of 38 subsurface soil samples were collected in 2 ft intervals from 0 ft bgs to the water table from 10 soil borings (SB010-SB01 through –SB10) shown on **Figure 3**. Only two samples collected from the 0 to 2 ft bgs interval had detections that exceeded the 6 NYCRR Part 375 Residential Use SCOs. Several PAHs were detected above the Residential Use SCOs in SS017-SB03(0-2) and SS017-SB10(0-2). **Figure 3** shows the PAH concentrations which were detected above the SCOs. It is important to note that numerous studies (e.g., Mahler et al., 2005 and Mahler et al., 2012) have documented that shallow soils below and adjacent to asphalt roadways and parking lots tend to have elevated concentrations of PAHs (e.g., benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; and indeno(1,2,3-cd)pyrene) as these are constituents of asphalt and coal-tar-based sealcoat. The correlation between the asphalt/coal-tar-based sealcoat and shallow soil is based on the diagnostic ratios of individual PAHs detected in both media (Mahler et al., 2005).

# 5 RISK ASSESSMENT

The purpose of the risk assessment is to demonstrate that exposures to the COPCs to the future resident and construction worker are within the cancer risk range from the NCP (USEPA, 1990) of 10-6 to 10-4 and at or below the goal of protection of an HI or HQ = 1 based on organ specific effects. Site SS017 is currently subject to deed restrictions due to residual soil impacts. The evaluation of the risk to current and potential future human receptors due to the presence of these residual impacts is detailed in the Baseline HHRA for Site SS017 (Bhate, August 2019), which is presented in **Attachment 1** of this report. The risk assessment consists of the following and are generalized below:

1. Identification of COPCs
2. Development of Exposure Assessment
3. Toxicity Assessment
4. Risk Characterization
5. Uncertainty Analysis

## 5.1 Identification of Chemicals of Potential Concern

During the June 2017 SI, 44 soil samples including four duplicates were collected. Of the 44 samples, 17 samples including one duplicate, were collected from 0 to 2 ft bgs. The remaining 27 samples including three duplicates, were collected from depths ranging from >2 ft bgs to 8 ft bgs. From the 136 chemicals analyzed, 53 were detected in at least one soil sample. Only detected carcinogenic chemicals exceeding Regional Screening Levels (RSLs) and non-carcinogenic chemicals exceeding RSLs detected at a frequency exceeding 5% were carried forward. Additionally, benzene and TCE, known human carcinogens, were included to be consistent with Section 5.9.1 of the RAGS Part A. Screening values were based on residential exposures associated with a cancer risk of 1 x 10-6 and a non-cancer Hazard Index = 0.1 to address exposures to multiple chemicals that effect the same target organ. The exposures included the young child (6 years and younger) and adults (18 years and older) exposed for 350 days/year for a period of 26 years (6 years as a child and 20 years as an adult). It is important to note that this screening is conducted to assure that chemicals are not prematurely removed from the risk assessment (e.g., the risks are not underestimated).

## 5.2 Development of Exposure Assessment

Potential exposures and receptors were evaluated in accordance with RAGS Part D Table 1 (USEPA, 1989). The exposure assessment evaluates the potential ways in which the receptors (future young child and adult resident and future construction worker) may contact the soils (e.g. ingestion, contact with skin, and inhalation of soil particulates). The exposure assessment consists of identifying the complete exposure pathways and calculation of dose. As indicated previously, currently the land is now occupied by Buildings 11 and 15 (Vehicle Maintenance Facility) and a large asphalt paved lot associated with these buildings, which are for parking and

equipment storage (**Figure 2**). Lot 69 currently houses a Birnie Bus maintenance facility. The complete exposure pathways are presented in Table 1 of the Baseline HHRA (Bhate, August 2019) (**Attachment 1**).

## 5.3 Toxicity Assessment

The toxicity assessment determines the types of adverse health effects potentially associated with exposures to COPCs at the Site and the relationship between the magnitude of exposure (dose) and severity of adverse effects (response). The Office of Solid Waste and Environmental Response Directive 9285.7-53 (USEPA, December 2003) provides a recommended hierarchy of toxicological data sources that includes the following Tiers:

- Tier 1 - USEPA's Integrated Risk Information System.
- Tier 2 - USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center develops PPRTVs on a chemical specific basis when requested by USEPA's Superfund program.
- Tier 3 - Other Toxicity Values – Tier 3 includes additional USEPA and non-USEPA sources of toxicity information. Priority is given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed.

**Attachment 1** of this report provides the RAGS Part D Tables 5.1 to 5.4 and 6.1 to 6.2 that identify relevant endpoints and toxicity benchmarks. **Attachment 1**, Tables 5.1 to 5.4 provide non-cancer toxicity values (i.e., reference doses and reference concentrations [both chronic and subchronic]). Tables 6.1 and 6.2 provide cancer toxicity information (e.g., cancer slope factors and inhalation unit risks).

## 5.4 Risk Characterization

Risks were calculated for carcinogenic and non-carcinogenic exposures for the various receptors and pathways. A HQ/HI less than 1 implies an acceptable level of non-cancer health hazards that does not warrant any further remediation. Similarly, a cumulative carcinogenic risk within the range of 1 x 10-6 to 1 x 10-4 typically does not warrant remediation. The Baseline HHRA evaluates exposures under an assumption of future residential land use. The receptors evaluated include: a future resident (adult and child) and a construction worker. The future adult resident receptor was not evaluated because the young child is the most sensitive receptor. The assessment assumes the future receptors may be exposed to soils at depths of 0 to 2 ft bgs and 0 ft bgs to the Water Table. The exposures include direct contact with the soil at both depths in the event the soil is brought to the surface and not managed.

The risk assessment results for each receptor are summarized in the Table below.

| | Cancer Risks | | Non-cancer Hazard | |
|---|---|---|---|---|
| | Soil Depth | | Soil Depth | |
| | 0 to 2 ft bgs | 0 ft bgs to Water Table | 0 to 2 ft bgs | 0 ft bgs to Water Table |
| Receptors | | | | |
| Future Resident | | | | |
| Adult/Child (combined) * | 1.8E-04 | 7.5E-05 | | |
| Young Child | | | 1.8 | 1.2 |
| Adult | | | 0.2 | 0.13 |
| Future Construction Worker (Adult) | 1.6E-07 | 7.2E-08 | 0.2 | 0.2 |
| *Non-cancer hazards were not calculated since the young child is the most sensitive receptor. | | | | |

Exposure to soils under a future residential land use had a cancer risk within the upper bounds of the risk range established under the NCP (USEPA, 1990) and the non-cancer HI slightly exceed the goal of protection of an HI = 1. Consistent with the *Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures* (USEPA, August 2000), evaluation of the non-cancer hazards based on target organ indicates that the HI is less than 1 for each chemical based on target organ. The highest HI for impacts was an HI = 0.66 for developmental effects from exposure to benzo(a)pyrene. The next highest HI was from neurological effects for aluminum and manganese (non-diet) and was calculated to be 0.35. Future construction worker exposures had a cancer risk below the risk range established under the NCP and the non-cancer HI was below the goal of protection of an HI = 1.

### 5.4.1 Risk Management for PAH Impacts

The United States Geological Survey (USGS) has identified asphalt and coal-tar-based sealcoat sprayed on asphalt pavement, such as parking lots, as a major source of PAH contamination. Numerous studies (e.g., Long et al., July 2016; Mahler et al., 2005; and Mahler et al., 2012) have shown that shallow soils below and adjacent to asphalt roadways and parking lots have elevated concentrations of PAHs as these are constituents of asphalt and coal-tar-based sealcoat. Coal-tar-based sealcoat is a black liquid that is sprayed on asphalt pavement to maintain and protect residential driveways and parking lots associated with commercial businesses (e.g., shopping centers, apartment complexes, churches, schools, and business parks) throughout the United States and Canada. Coal-tar-based sealcoat typically contains 20 to 35% coal tar pitch, which is 50% or more PAHs by weight (Mahler et al., 2005).

In the United States, coal-tar-based sealcoat is used primarily east of the continental divide. Coal-tar distillation plants are located near steal manufacturing mills, which are located in the central and eastern United States. An estimated 85 million gallons of coal-tar-based sealcoat are used annually in the United States. The contribution of asphalt pavement sealcoat (containing approximately 200 PAH compounds) to PAH contamination of soils has only recently been recognized. PAHs from coal-tar-based pavement sealcoat are transported by two

different pathways to the soil. Over time when exposed to heat and dryness, the sealcoat breaks down into a powder and becomes part of the dust on the pavement. Parking lot dust is transported by wind and rainwater runoff to nearby surface and subsurface soils (Mahler et al., 2012).

In an effort to avoid PAH impacts from asphalt, the six surface soil samples (collected from 0 to 2 inches bgs) were collected within the grassy areas adjacent to the asphalt parking lot during the Site SS017 Supplemental SI (June 2017). However, the 10 soil borings were advanced into or immediately adjacent to the asphalt parking lot (see **Figure 3**). As discussed in Section 4.1.2, only two samples collected from 0 to 2 ft bgs in borings SS017-SB03 and –SB010 had several PAH detections (benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; and indeno(1,2,3-cd)pyrene) that exceeded applicable Residential Use SCOs. The sample collected in the surface soil from SS017-SB03 had detections of PAHs at levels 10 times higher than SS017-SB010. The fact that asphalt pavement/coal tar sealcoat has resulted in the presence of anthropogenic PAHs in these surface soil samples, particularly in SS017-SB03, is further strengthened by the fact that these elevated PAHs are only observed in the 0 to 2 ft bgs interval. In the soil collected from the 2 to 4 ft bgs interval in the same boring, the PAHs are approximately 40 times lower. If the source of the PAHs were a petroleum fluid leak, the depth of PAH contamination would not be confined to less than 2 ft bgs. PAHs detected at Site SS017 are not due to a release from historical operations conducted at the site.

The correlation between the asphalt/coal-tar-based sealcoat and shallow soil is based on the diagnostic ratios of individual PAHs detected in both media (Long et al., July 2016). **Table 2** presents the PAHs from commercially available sealcoat (Long et al., July 2016) and compares the results to that of SS017-SB03. The highest percentage of PAHs in the sealcoat comes from phenanthrene, pyrene, and fluoranthene which is the same three highest percentage PAHs found in SS017-SB03. Also, the percentage of total PAHs in sealcoat is comparable to that in the SS017-SB03 sample.

Based on the aerial photograph showing the site boundary (**Figure 2**), asphalt pavement covers approximately 70% of the Site SS017 footprint. As stated above, PAHs were detected above Residential Use SCOs in two soil borings (0 to 2 ft bgs interval) located within/adjacent to the asphalt pavement footprint. In accordance with standard construction practices, the asphalt pavement and subgrade would be removed from 0 to 2 ft below grade and disposed offsite prior to any future residential (e.g., housing, schools, etc.) or commercial development. As presented in the Baseline HHRA (**Attachment 1,** Appendix C, Tables 7.1(a) and 7.1(b)) the total cancer risks for exposure to soils from 0 to 2 ft bgs under a future residential land use was 1.8 x 10-4 and is within the upper bounds of the risk range. However, the Site SS017 95% Upper Confidence Limit (UCL) calculations presented in **Attachment 1**, Appendix D were above the NYCRR Part 375 Residential Use SCOs for several PAHs (benzo(a)anthracene; benzo(a)pyrene; dibenz(a,h)anthracene; and indeno(1,2,3-cd)pyrene) detected in soil from 0 to 2 ft bgs. However, it is important to note that the risk assessment and 95% UCL calculations do not

consider soil removal and offsite disposal in the evaluation. However, the redevelopment of the property for uses other than those currently would significantly reduce any risk associated with the PAHs detected.

## 5.5 Uncertainty Analysis

The risk assessment is based on health protective values of the parameters and models used to calculate the carcinogenic and non-cancer health hazards. The data was specifically collected to fill identified data gaps and was considered of sufficient quality and quantity to complete the risk evaluation. The exposure assessment assumes the land use will be residential. The assumption of residential land use determines the choice of receptors and exposure parameters evaluated. In calculating risk, health protective exposure factors were used such as a child exposed to the surface soil for 6 years at a rate of 350 days a year. The process of evaluating cancer risks and non-cancer hazards involves multiple steps. Inherent in each step of the risk assessment process (hazard identification, dose-response, exposure assessment, and risk characterization) are uncertainties that ultimately affect the final cancer risk and non-cancer health hazard estimates. Uncertainties may exist in numerous areas of the process, including environmental concentration data, derivation of toxicity values, and estimation of potential site exposures. Chemical specific toxicity values used to calculate the carcinogenic and non-cancer health hazards are based on health protective toxicological assessments and may overestimate or underestimate the risk depending on the availability of toxicological information. For example, chemicals lacking toxicity information are not included in the calculation of cancer risks and non-cancer hazards and this leads to an underestimate of cancer risks and non-cancer hazards.

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# 6 CONCLUSIONS AND RECOMMENDATIONS

The results of the risk assessment indicate that the risks to the future resident are within the upper bounds of the NCP risk range for cancer risk of 1 x 10-6 to 1 x 10-4. The non-cancer hazards based on the Target Organ were below the NCP goal of protection of a HI = 1. The cancer risks to the future construction worker were below the goal of protection of 1 x 10-6 or one in a million. The non-cancer HI was also below the goal of protection of an HI = 1.

However, the 95% UCL calculations were above the NYCRR Part 375 Residential Use SCOs for several PAHs. The results of the risk assessment also indicate that a major contributor to both the carcinogenic risks and non-cancer hazards are PAHs (e.g., benzo(a)pyrene) related to the asphalt (and coal-tar-based sealcoat) which covers approximately 70% of the Site SS017 footprint. As discussed in Section 5.4.1 (Risk Management for PAH Impacts), numerous studies (e.g., Mahler et al., 2005 and Mahler et al., 2012) have documented that shallow soils below and adjacent to asphalt roadways and parking lots tend to have elevated concentrations of PAHs (e.g., benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; dibenz(a,h)anthracene; and indeno(1,2,3-cd)pyrene) as these are constituents of asphalt and coal-tar-based sealcoat. The correlation between the asphalt/coal-tar-based sealcoat and shallow soil is based on the diagnostic ratios of individual PAHs detected in both media (Mahler et al., 2005). Furthermore, if Site SS017 were to be redeveloped in the future, the asphalt pavement and subgrade would be removed from 0 to 2 ft below grade and disposed offsite prior to any future residential (e.g., housing, schools, etc.) or commercial development.

Therefore, it is requested that the site be closed and that the NYS and USEPA grant permission to remove the remaining non-residential use deed restriction at Site SS017 so the land use may be unrestricted.

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# TABLES

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part 375 6.8(b) Residential | SS017-SS01 | SS017-SB01(0-2) | SS017-SB01(2-4) | SS017-SB01(4-6) | SS017-SB01(6-8) | SS017-SB02(0-2) | SS017-SB02(2-4) | SS017-SB02(4-6) | SS017-SB02(6-8) | SS017-SS03 | SS017-SB03(0-2) | SS017-SB03(2-4) | SS017-SB03(2-4)-a | SS017-SB03(4-6) | SS017-SB03(4-6)-a | SS017-SB03(6-8) | SS017-SB04(0-2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 |
| Depth to water | | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs |
| **VOCs (8260B) (µg/kg)** | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,1,1-Trichloroethane | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,1,2,2-Tetrachloroethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,1,2-Trichloroethane | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| 1,1-Dichloroethane | 19,000 | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| 1,1-Dichloroethene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,1-Dichloropropene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2,3-Trichlorobenzene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2,3-Trichloropropane | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 UJ | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| 1,2,4-Trichlorobenzene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2,4-Trimethylbenzene | 47,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2-Dibromo-3-Chloropropane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2-Dibromoethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2-Dichlorobenzene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2-Dichloroethane | 2,300 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2-Dichloroethene, Total | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,2-Dichloropropane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,3,5-Trimethylbenzene | 47,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,3-Dichlorobenzene | 17,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,3-Dichloropropane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 1,4-Dichlorobenzene | 9,800 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 2,2-Dichloropropane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 2-Butanone (MEK) | 100,000 | 5.7 U | 4.8 U | 7.9 U | 7.1 UJ | 6.1 U | 5.5 U | 11 U | 6.7 U | 5.7 U | 5.9 U | 5.6 U | 5.2 U | 6.1 U | 6.0 U | 6.1 U | 5.5 U | 6.6 U |
| 2-Chlorotoluene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 2-Hexanone | NV | 11 U | 9.6 U | 16 U | 14 UJ | 12 U | 11 U | 23 U | 13 U | 11 U | 12 U | 11 U | 10 U | 12 U | 12 U | 12 U | 11 U | 13 U |
| 4-Chlorotoluene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 4-Isopropyltoluene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| 4-Methyl-2-pentanone (MIBK) | NV | 11 U | 9.6 U | 16 U | 14 UJ | 12 U | 11 U | 23 U | 13 U | 11 U | 12 U | 11 U | 10 U | 12 U | 12 U | 12 U | 11 U | 13 U |
| Acetone | 100,000 | 11 U | 9.6 U | 16 U | 14 UJ | 88 UB | 6.8 UB | 26 UB | 8.8 UB | 27 UB | 12 U | 11 U | 10 U | 12 U | 12 U | 12 U | 54 UB | 13 U |
| Benzene | 2,900 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Bromobenzene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Bromochloromethane | NV | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| Bromodichloromethane | NV | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| Bromoform | NV | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| Bromomethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Carbon disulfide | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | **1.2** J | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Carbon tetrachloride | 1,400 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Chlorobenzene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Chloroethane | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Chloroform | 10,000 | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| Chloromethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| cis-1,2-Dichloroethene | 59,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| cis-1,3-Dichloropropene | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Dibromochloromethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Dibromomethane | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Dichlorodifluoromethane | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Ethylbenzene | 30,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Hexachlorobutadiene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Isopropyl ether | NV | 7.1 U | 6.0 U | 9.8 UJ | 8.8 UJ | 7.7 UJ | 6.9 U | 14 U | 8.4 U | 7.1 U | 7.3 U | 7.0 UJ | 6.5 UJ | 7.6 UJ | 7.5 UJ | 7.6 UJ | 6.9 UJ | 8.3 UJ |
| Isopropylbenzene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| m&p-Xylene | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Methyl iodide | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Methyl tert-butyl ether | 62,000 | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| Methylene Chloride | 51,000 | 2.9 U | 2.4 U | 3.9 U | **2.0** J | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Naphthalene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | **5.2** | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| n-Butylbenzene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| N-Propylbenzene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| o-Xylene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| sec-Butylbenzene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Styrene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| tert-Butylbenzene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 UJ | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Tetrachloroethene | 5,500 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Toluene | 100,000 | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| trans-1,2-Dichloroethene | 100,000 | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part | SS017-SS01 | SS017-SB01(0-2) | SS017-SB01(2-4) | SS017-SB01(4-6) | SS017-SB01(6-8) | SS017-SB02(0-2) | SS017-SB02(2-4) | SS017-SB02(4-6) | SS017-SB02(6-8) | SS017-SS03 | SS017-SB03(0-2) | SS017-SB03(2-4) | SS017-SB03(2-4)-a | SS017-SB03(4-6) | SS017-SB03(4-6)-a | SS017-SB03(6-8) | SS017-SB04(0-2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | 375 6.8(b) | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 |
| Depth to water | Residential | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs |
| trans-1,3-Dichloropropene | NV | 1.4 U | 1.2 U | 2.0 U | 1.8 UJ | 1.5 U | 1.4 U | 2.8 U | 1.7 U | 1.4 U | 1.5 U | 1.4 U | 1.3 U | 1.5 U | 1.5 U | 1.5 U | 1.4 U | 1.7 U |
| Trichloroethene | 10,000 | 0.71 U | 0.60 U | 0.98 U | 0.88 UJ | 0.77 U | 0.69 U | 1.4 U | 0.84 U | 0.71 U | 0.73 U | 0.70 U | 0.65 U | 0.76 U | 0.75 U | 0.76 U | 0.69 U | 0.83 U |
| Trichlorofluoromethane | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Vinyl acetate | NV | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Vinyl chloride | 210 | 2.9 U | 2.4 U | 3.9 U | 3.5 UJ | 3.1 U | 2.7 U | 5.6 U | 3.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U | 3.0 U | 3.0 U | 2.8 U | 3.3 U |
| Xylenes (total) | 100,000 | 0.89 U | 0.75 U | 1.2 U | 1.1 UJ | 0.96 U | 0.86 U | 1.8 U | 1.1 U | 0.89 U | 0.92 U | 0.88 U | 0.82 U | 0.95 U | 0.94 U | 0.95 U | 0.86 U | 1.0 U |
| **PAHs (8270D SIM) (µg/kg)** | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | NV | **2.5** J | **0.98** J | 0.54 U | 0.54 U | **0.75** J | **1.0** J | 0.50 U | **0.99** J | 0.52 U | **21** | **430** J | **10** J | **20** J | **0.40** J | 0.53 U | **0.40** J | **97** |
| 2-Methylnaphthalene | NV | **3.3** J | **1.7** J | 0.71 U | 0.72 U | **1.0** J | **1.3** J | 0.67 U | **2.9** J | 0.69 U | **30** | **520** J | **12** J | **27** J | **0.64** J | 0.71 U | **1.1** J | **110** |
| Acenaphthene | 100,000 | **7.9** J | **3.2** J | 0.29 U | 0.29 U | 0.28 U | **2.5** J | 0.27 U | 0.28 U | 0.28 U | **3.9** J | **3,200** J | **67** | **100** | **1.8** J | **0.82** J | **0.33** J | **20** J |
| Acenaphthylene | 100,000 | **10** J | **2.4** J | 0.71 U | 0.72 U | **1.0** J | **7.0** | 0.67 U | 0.69 U | **0.19** J | **8.3** | **270** J | **5.9** J | **9.3** J | **0.28** J | 0.71 U | 0.77 U | **11** J |
| Anthracene | 100,000 | **32** | **11** | 2.7 U | 2.7 U | **1.2** J | **14** | 2.5 U | 2.6 U | 2.6 U | **18** | **7,200** J | **180** | **250** | **4.4** J | **1.8** J | 2.9 U | **49** |
| Benzo[a]anthracene | 1,000 | **110** | **43** | 2.7 U | 2.7 U | **3.0** J | **93** | 2.5 U | 2.6 U | 2.6 U | **71** | **19,000** J | **450** | **560** | **13** J | **3.9** J | 2.9 U | **170** |
| Benzo[a]pyrene | 1,000 | **98** | **41** | 2.7 U | 2.7 U | **2.7** J | **100** | 2.5 U | 2.6 U | **0.82** J | **83** | **17,000** J | **380** 44.74 | **460** | **11** J | **3.5** J | 2.9 U | **170** |
| Benzo[b]fluoranthene | 1,000 | **150** | **59** | 2.7 U | 2.7 U | **11** | **140** | 2.5 U | 2.6 U | **1.3** J | **110** | **23,000** J | **550** 41.82 | **640** | **16** J | **4.9** J | 2.9 U | **250** |
| Benzo[g,h,i]perylene | 100,000 | **61** | **25** | 2.7 U | 2.7 U | **3.4** J | **65** | 2.5 U | 2.6 U | 2.6 U | **50** | **9,000** J | **190** 47.37 | **230** | **6.7** J | **2.0** J | 2.9 U | **99** |
| Benzo[k]fluoranthene | 1,000 | **51** | **23** | 2.7 U | 2.7 U | **2.1** J | **41** | 2.5 U | 2.6 U | 2.6 U | **36** | **7,700** J | **210** 36.67 | **230** | **6.0** J | **1.7** J | 2.9 U | **89** |
| Chrysene | 1,000 | **150** | **50** | 2.7 U | 2.7 U | **8.1** | **110** | 2.5 U | 2.6 U | 2.6 U | **89** | **23,000** J | **520** 44.23 | **640** | **14** J | **4.5** J | 2.9 U | **210** |
| Dibenz(a,h)anthracene | 330 | **19** J | **8.1** | 2.7 U | 2.7 U | 2.7 U | **20** | 2.5 U | 2.6 U | 2.6 U | **14** | **3,000** J | **66** 45.45 | **79** | **2.0** J | 2.7 U | 2.9 U | **29** |
| Fluoranthene | 100,000 | **250** | **71** | 2.7 U | 2.7 U | **10** | **120** | 2.5 U | 2.6 U | **1.0** J | **130** | **42,000** J | **950** 44.21 | **1,200** | **26** J | **7.8** J | **2.1** J | **370** |
| Fluorene | 100,000 | **10** J | **2.2** J | 0.71 U | 0.72 U | **1.9** J | **2.9** J | 0.67 U | 0.69 U | 0.69 U | **4.1** J | **3,000** J | **52** 57.69 | **95** J | **1.6** J | **0.73** J | **0.77** J | **17** J |
| Indeno[1,2,3-cd]pyrene | 500 | **54** | **23** | 2.7 U | 2.7 U | **3.5** J | **57** | 2.5 U | 2.6 U | 2.6 U | **39** | **8,400** J | **190** 44.21 | **220** | **6.3** J | **1.9** J | 2.9 U | **90** |
| Naphthalene | 100,000 | **4.1** J | **1.2** J | 0.71 U | 0.72 U | **1.4** J | **1.2** J | 0.67 U | **5.8** | 0.69 U | **24** | **970** J | **17** J | **45** J | **0.72** J | **0.46** J | **0.72** J | **77** |
| Phenanthrene | 100,000 | **140** | **26** | 2.7 U | 2.7 U | **6.4** | **35** | 2.5 U | 2.6 U | 2.6 U | **48** | **30,000** J | **510** | **840** | **16** J | **6.2** J | 2.9 U | **220** |
| Pyrene | 100,000 | **200** | **63** | 2.7 U | 2.7 U | **7.3** | **120** | 2.5 U | 2.6 U | **1.1** J | **120** | **34,000** J | **820** | **1,000** | **22** J | **6.5** J | **1.8** J | **320** |
| **Pesticides (8081B) (µg/kg)** | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | 2,600 | 1.9 U | 1.7 U | 1.7 U | 1.9 U | 1.7 U | 1.7 U | 1.6 U | 1.7 U | 1.7 U | 1.7 U | 17 U | 1.8 U | 1.7 U | 1.9 U | 1.9 U | 1.9 U | **1.1** J |
| 4,4'-DDE | 1,800 | **1.3** J | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | **41** J |
| 4,4'-DDT | 1,700 | 19 U | 1.7 U | 1.7 U | 1.9 U | 1.7 U | 17 U | 1.6 U | 1.7 U | 1.7 U | 17 U | **110** | 18 U | 17 U | 1.9 U | 1.9 U | 1.9 U | **120** J |
| Aldrin | 19 | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| alpha-BHC | 97 | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| alpha-Chlordane | 910 | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| beta-BHC | 72 | 1.9 U | 1.7 U | 1.7 U | 1.9 U | 1.7 U | 1.7 U | 1.6 U | 1.7 U | 1.7 U | 1.7 U | 17 U | 1.8 U | 1.7 U | 1.9 U | 1.9 U | 1.9 U | 1.8 U |
| delta-BHC | 100,000 | 1.1 U | 1.0 U | 1.0 U | 1.1 U | 1.0 U | 1.0 U | 0.97 U | 0.99 U | 0.99 U | 1.0 U | 10 U | 1.1 U | 1.0 U | 1.1 U | 1.1 U | 1.2 U | 1.1 U |
| Dieldrin | 39 | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| Endosulfan I | 4,800* | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| Endosulfan II | 4,800* | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| Endosulfan sulfate | 4,800* | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | **0.39** J |
| Endrin | 2,200 | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| Endrin aldehyde | NV | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| gamma-BHC (Lindane) | 280 | 1.1 U | 1.0 U | 1.0 U | 1.1 U | 1.0 U | 1.0 U | 0.97 U | 0.99 U | 0.99 U | 1.0 U | 10 U | 1.1 U | 1.0 U | 1.1 U | 1.1 U | 1.2 U | 1.1 U |
| gamma-Chlordane | NV | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | **13** J | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| Heptachlor | 420 | 0.76 U | 0.67 U | 0.70 U | 0.74 U | 0.70 U | 0.68 U | 0.65 U | 0.66 U | 0.66 U | 0.70 U | 6.8 U | 0.72 U | 0.68 U | 0.75 U | 0.76 U | 0.78 U | 0.71 U |
| Heptachlor epoxide | NV | 1.1 U | 1.0 U | 1.0 U | 1.1 U | 1.0 U | 1.0 U | 0.97 U | 0.99 U | 0.99 U | 1.0 U | 10 U | 1.1 U | 1.0 U | 1.1 U | 1.1 U | 1.2 U | 1.1 U |
| Methoxychlor | NV | 11 U | 1.0 U | 1.0 U | 1.1 U | 1.0 U | 10 U | 0.97 U | 0.99 U | 0.99 U | 10 U | **26** J | 11 U | 10 U | 1.1 U | 1.1 U | 1.2 U | 11 U |
| Toxaphene | NV | 37 U | 33 U | 34 U | 37 U | 34 U | 34 U | 32 U | 33 U | 33 U | 35 U | 330 U | 35 U | 34 U | 37 U | 37 U | 38 U | 35 U |
| **PCBs (8082A) (µg/kg)** | | | | | | | | | | | | | | | | | | |
| Arochlor 1016 | 1,000 | 17 U | 15 U | 16 U | 17 U | 16 U | 15 U | 15 U | 15 U | 15 U | 16 UJ | 61 U | 16 U | 15 U | 17 U | 17 U | 17 U | 16 U |
| Arochlor 1221 | 1,000 | 19 U | 17 U | 18 U | 19 U | 18 U | 17 U | 17 U | 17 U | 17 U | 18 UJ | 69 U | 18 U | 17 U | 19 U | 19 U | 20 U | 18 U |
| Arochlor 1232 | 1,000 | 17 U | 15 U | 16 U | 17 U | 16 U | 15 U | 15 U | 15 U | 15 U | 16 UJ | 61 U | 16 U | 15 U | 17 U | 17 U | 17 U | 16 U |
| Arochlor 1242 | 1,000 | 37 U | 33 U | 34 U | 37 U | 34 U | 34 U | 32 U | 33 U | 33 U | 35 UJ | 130 U | 35 U | 34 U | 37 U | 37 U | 38 U | 35 U |
| Arochlor 1248 | 1,000 | 23 U | 20 U | 21 U | 22 U | 21 U | 20 U | 19 U | 20 U | 20 U | 21 UJ | 81 U | 21 U | 20 U | 22 U | 23 U | 23 U | 21 U |
| Arochlor 1254 | 1,000 | 19 U | 17 U | 18 U | 19 U | 18 U | 17 U | 17 U | 17 U | 17 U | 18 UJ | 69 U | 18 U | 17 U | 19 U | 19 U | 20 U | 18 U |
| Arochlor 1260 | 1,000 | **55** | 7.7 U | 8.0 U | 8.5 U | 8.0 U | **20** J | 7.5 U | 7.6 U | 7.6 U | **89** J | **660** | 8.3 U | **11** J | 8.6 U | 8.7 U | 8.9 U | **10** J |

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part 375 6.8(b) Residential | SS017-SS01 | SS017-SB01(0-2) | SS017-SB01(2-4) | SS017-SB01(4-6) | SS017-SB01(6-8) | SS017-SB02(0-2) | SS017-SB02(2-4) | SS017-SB02(4-6) | SS017-SB02(6-8) | SS017-SS03 | SS017-SB03(0-2) | SS017-SB03(2-4) | SS017-SB03(2-4)-a | SS017-SB03(4-6) | SS017-SB03(4-6)-a | SS017-SB03(6-8) | SS017-SB04(0-2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/2/2017 |
| Depth to water | | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs |
| **Metals (6010C/7471A) (mg/kg)** | | | | | | | | | | | | | | | | | | |
| Aluminum | NV | **7,300** | **4,200** | **2,700** | **3,200** | **9,900** | **4,300** | **3,400** | **2,400** | **4,100** | **4,800** | **6,700** J | **3,000** J | **9,100** J | **2,900** J | **4,900** J | **6,500** | **3,700** |
| Antimony | NV | **1.3** U | 1.3 U | 1.3 U | 1.4 U | 1.3 U | 1.1 U | 1.3 U | 1.2 U | 1.1 U | 1.1 U | 1.3 UJ | 1.2 U | 1.4 U | 1.4 U | 1.4 U | 1.3 U | 1.5 U |
| Arsenic | 16 | **5.4** | **2.0** J | **1.4** J | **1.9** J | **2.5** | **2.3** | **2.1** | **1.4** J | **2.2** | **3.0** | **3.9** J | **1.8** J | **3.2** J | **1.8** J | **2.1** J | **2.5** | **2.3** J |
| Barium | 350 | **39** | **16** | **9.6** | **9.4** | **39** | **16** | **13** | **7.9** | **14** | **19** | **30** J | **12** J | **41** J | **12** | **15** | **45** | **16** |
| Beryllium | 14 | **0.37** J | **0.18** J | **0.11** J | **0.15** J | **0.23** J | **0.16** J | **0.13** J | **0.11** J | **0.16** J | **0.24** J | **0.27** J | **0.13** J | **0.36** J | **0.12** J | **0.19** J | **0.27** J | **0.14** J |
| Cadmium | 2.5 | **0.14** J | 0.13 U | 0.13 U | 0.14 U | **0.048** J | **0.036** J | 0.13 U | 0.12 U | **0.038** J | **0.12** J | **0.072** J | 0.12 U | **0.090** J | 0.14 U | 0.14 U | **0.053** J | 0.15 U |
| Calcium | NV | **34,000** | **3,300** | **790** | **640** | **1,100** | **4,400** | **1,300** | **2,000** | **620** | **29,000** | **29,000** J | **1,400** J | **3,500** J | **640** | **1,000** | **1,000** | **1,400** |
| Chromium | NV | **9.7** | **5.1** | **3.2** | **3.3** | **9.9** | **4.8** | **3.6** | **2.8** | **4.3** | **5.8** | **7.7** | **3.3** J | **14** J | **3.1** J | **5.3** J | **7.3** | **5.2** |
| Cobalt | NV | **6.0** | **2.9** | **2.0** | **2.2** | **3.7** | **2.9** | **2.6** | **1.9** | **2.7** | **3.3** | **4.7** J | **2.1** J | **4.7** J | **2.2** | **3.0** | **4.8** | **2.5** |
| Copper | 270 | **21** | **9.4** | **6.4** | **7.6** | **9.5** | **9.5** | **8.6** | **5.7** | **10** | **13** | **24** J | **7.3** J | **14** J | **6.4** | **10** | **7.3** | **9.6** |
| Iron | NV | **15,000** | **8,500** | **6,000** | **6,900** | **14,000** | **8,700** | **7,500** | **5,600** | **7,900** | **10,000** | **14,000** J | **6,600** J | **17,000** J | **6,200** | **9,600** | **9,400** | **7,900** |
| Lead | 400 | **11** | **2.7** | **1.6** | **1.6** | **6.7** | **3.2** | **1.9** | **1.2** | **2.0** | **7.3** | **10** J | **1.8** J | **6.5** J | **1.4** | **2.1** | **3.9** | **5.4** |
| Magnesium | NV | **3,700** | **1,600** | **1,100** | **1,200** | **2,000** | **1,700** | **1,300** | **1,200** | **1,300** | **3,700** | **3,700** J | **1,200** J | **2,100** J | **1,100** | **1,700** | **1,500** | **1,400** |
| Manganese | 2,000 | **550** | **280** | **220** | **100** | **120** | **310** | **270** | **190** | **270** | **300** | **560** J | **230** J | **640** J | **210** | **230** | **120** | **280** |
| Mercury (µg/kg) | 810 | **38** | **14** J | 17 U | 16 U | **42** | **12** J | 15 U | 15 U | 17 U | **13** J | **29** | 15 U | **31** | 18 U | **12** J | **17** J | 16 U |
| Nickel | 140 | **15** | **6.4** | **4.6** | **4.7** | **8.2** | **6.4** | **5.4** | **4.3** | **5.6** | **7.8** | **10** J | **4.8** J | **10** J | **4.8** | **6.7** | **7.5** | **6.1** |
| Potassium | NV | **1,100** | **570** | **410** | **430** | **690** | **580** | **490** | **410** | **470** | **720** | **840** J | **450** | **680** | **450** | **530** | **540** | **550** |
| Selenium | 36 | 2.6 U | 2.6 U | 2.6 U | 2.8 U | 2.6 U | 2.2 U | 2.6 U | 2.4 U | 2.2 U | 2.3 U | 2.5 UJ | 2.4 U | 2.9 U | 2.9 U | 2.8 U | 2.6 U | 3.0 U |
| Silver | 36 | 0.51 U | 0.52 U | 0.52 U | 0.55 U | 0.53 U | 0.44 U | 0.51 U | 0.47 U | 0.45 U | 0.46 U | 0.51 UJ | 0.49 U | 0.58 U | 0.57 U | 0.57 U | 0.52 U | 0.60 U |
| Sodium | NV | **88** J | **160** J | **170** J | **150** J | **320** J | **110** J | **60** J | **110** J | **290** J | **66** J | **300** J | **140** J | **340** J | **160** J | **190** J | **260** J | **410** J |
| Thallium | NV | 2.1 U | 2.2 U | 2.2 U | 2.3 U | 2.2 U | 1.8 U | 2.1 U | 2.0 U | 1.9 U | 1.9 U | 2.1 UJ | 2.0 U | 2.4 U | 2.4 U | 2.4 U | 2.2 U | 2.5 U |
| Vanadium | NV | **14** | **7.6** | **5.1** | **5.7** | **16** | **7.5** | **6.0** | **4.5** | **6.3** | **11** | **12** J | **5.4** J | **15** J | **5.2** | **7.8** | **13** | **6.9** |
| Zinc | 2,200 | **48** | **24** | **13** | **14** | **29** | **21** | **16** | **12** | **18** | **45** | **43** J | **14** J | 43 J | **13** | **20** | **20** | **18** |

Notes:
VOCs = Volatile Organic Compounds; PAHs = Polycyclic Aromatic Hydrocarbons; SIM = Selected Ion Monitoring; PCBs = Polychlorinated Biphenyls; NYCRR = New York Codes, Rules, and Regulations; µg/kg = micrograms per kilogram; mg/kg = milligrams per kilogram; NV = no value
Detections are bolded.
*The sum of Endosulfan I, Endosulfan II, and Endosulfan sulfate.
J-estimated value between the detection limit and limit of quantitation and/or due to quality control issues
U-not detected
UJ-estimated not detected due to quality control issues
UB-considered an artifact of blank contamination
Gray shading exceeds the Residential Soil Cleanup Objective

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part | SS017-SB04(2-4) | | SS017-SB04(4-6) | | SS017-SB04(6-8) | | SS017-SB05(0-2) | | SS017-SB05(2-4) | | SS017-SB05 (4-6) | | SS017-SB05(6-8) | | SS017-SS06 | | SS017-SB06(0-2) | | SS017-SB06(2-4) | | SS017-SB06(4-6) | | SS017-SS07 | | SS017-SB07(0-2) | | SS017-SB07(2-4) | | SS017-SB07(4-6) | | SS017-SS08 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | 375 6.8(b) | 6/2/2017 | | 6/2/2017 | | 6/2/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/2/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/2/2017 | |
| Depth to water | Residential | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 5.5 ft bgs | |
| **VOCs (8260B) (µg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,1,1-Trichloroethane | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,1,2,2-Tetrachloroethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,1,2-Trichloroethane | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| 1,1-Dichloroethane | 19,000 | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| 1,1-Dichloroethene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,1-Dichloropropene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2,3-Trichlorobenzene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2,3-Trichloropropane | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| 1,2,4-Trichlorobenzene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2,4-Trimethylbenzene | 47,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2-Dibromo-3-Chloropropane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2-Dibromoethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2-Dichlorobenzene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2-Dichloroethane | 2,300 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2-Dichloroethene, Total | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,2-Dichloropropane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,3,5-Trimethylbenzene | 47,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,3-Dichlorobenzene | 17,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,3-Dichloropropane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 1,4-Dichlorobenzene | 9,800 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 2,2-Dichloropropane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 2-Butanone (MEK) | 100,000 | 6.3 | U | 6.3 | U | 7.2 | U | 7.4 | U | 6.0 | U | 6.9 | U | 6.5 | U | 6.5 | UJ | 7.0 | U | 6.7 | U | 6.8 | U | 6.4 | U | 5.6 | U | 6.0 | U | **5.0** | J | 6.1 | U |
| 2-Chlorotoluene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 2-Hexanone | NV | 13 | U | 13 | U | 14 | U | 15 | U | 12 | U | 14 | U | 13 | U | 13 | UJ | 14 | U | 13 | U | 14 | U | 13 | U | 11 | U | 12 | U | 12 | U | 12 | U |
| 4-Chlorotoluene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 4-Isopropyltoluene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| 4-Methyl-2-pentanone (MIBK) | NV | 13 | U | 13 | U | 14 | U | 15 | U | 12 | U | 14 | U | 13 | U | 13 | UJ | 14 | U | 13 | U | 14 | U | 13 | U | 11 | U | 12 | U | 12 | U | 12 | U |
| Acetone | 100,000 | 13 | U | 5.7 | UB | 14 | U | 15 | U | 12 | U | 14 | U | 13 | U | 13 | UJ | 14 | U | 13 | U | 14 | U | 13 | U | 6.4 | UB | 29 | UB | 28 | UB | 10 | UB |
| Benzene | 2,900 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Bromobenzene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Bromochloromethane | NV | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| Bromodichloromethane | NV | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| Bromoform | NV | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| Bromomethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Carbon disulfide | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Carbon tetrachloride | 1,400 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Chlorobenzene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Chloroethane | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Chloroform | 10,000 | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| Chloromethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| cis-1,2-Dichloroethene | 59,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| cis-1,3-Dichloropropene | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Dibromochloromethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Dibromomethane | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Dichlorodifluoromethane | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Ethylbenzene | 30,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Hexachlorobutadiene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Isopropyl ether | NV | 7.8 | U | 7.9 | U | 8.9 | U | 9.3 | UJ | 7.5 | UJ | 8.6 | UJ | 8.2 | UJ | 8.2 | UJ | 8.7 | UJ | 8.3 | UJ | 8.5 | UJ | 8.0 | UJ | 6.9 | UJ | 7.5 | UJ | 7.5 | UJ | 7.6 | U |
| Isopropylbenzene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| m&p-Xylene | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Methyl iodide | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Methyl tert-butyl ether | 62,000 | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| Methylene Chloride | 51,000 | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Naphthalene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| n-Butylbenzene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| N-Propylbenzene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| o-Xylene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| sec-Butylbenzene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Styrene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| tert-Butylbenzene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Tetrachloroethene | 5,500 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Toluene | 100,000 | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| trans-1,2-Dichloroethene | 100,000 | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part | SS017-SB04(2-4) | | SS017-SB04(4-6) | | SS017-SB04(6-8) | | SS017-SB05(0-2) | | SS017-SB05(2-4) | | SS017-SB05 (4-6) | | SS017-SB05(6-8) | | SS017-SS06 | | SS017-SB06(0-2) | | SS017-SB06(2-4) | | SS017-SB06(4-6) | | SS017-SS07 | | SS017-SB07(0-2) | | SS017-SB07(2-4) | | SS017-SB07(4-6) | | SS017-SS08 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | 375 6.8(b) | 6/2/2017 | | 6/2/2017 | | 6/2/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/2/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/1/2017 | | 6/2/2017 | |
| Depth to water | Residential | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 9 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 6.5 ft bgs | | 5.5 ft bgs | |
| trans-1,3-Dichloropropene | NV | 1.6 | U | 1.6 | U | 1.8 | U | 1.9 | U | 1.5 | U | 1.7 | U | 1.6 | U | 1.6 | UJ | 1.7 | U | 1.7 | U | 1.7 | U | 1.6 | U | 1.4 | U | 1.5 | U | 1.5 | U | 1.5 | U |
| Trichloroethene | 10,000 | 0.78 | U | 0.79 | U | 0.89 | U | 0.93 | U | 0.75 | U | 0.86 | U | 0.82 | U | 0.82 | UJ | 0.87 | U | 0.83 | U | 0.85 | U | 0.80 | U | 0.69 | U | 0.75 | U | 0.75 | U | 0.76 | U |
| Trichlorofluoromethane | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Vinyl acetate | NV | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Vinyl chloride | 210 | 3.1 | U | 3.1 | U | 3.6 | U | 3.7 | U | 3.0 | U | 3.4 | U | 3.3 | U | 3.3 | UJ | 3.5 | U | 3.3 | U | 3.4 | U | 3.2 | U | 2.8 | U | 3.0 | U | 3.0 | U | 3.1 | U |
| Xylenes (total) | 100,000 | 0.98 | U | 0.98 | U | 1.1 | U | 1.2 | U | 0.94 | U | 1.1 | U | 1.0 | U | 1.0 | UJ | 1.1 | U | 1.0 | U | 1.1 | U | 1.0 | U | 0.87 | U | 0.94 | U | 0.94 | U | 0.96 | U |
| **PAHs (8270D SIM) (µg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | NV | **1.4** | J | 0.52 | U | 0.81 | U | 0.48 | U | **2.2** | J | 0.56 | U | 0.55 | U | **4.6** | J | **1.2** | J | 0.53 | U | **0.46** | J | **3.5** | J | **9.1** | J | **3.7** | J | **3.5** | J | **0.44** | J |
| 2-Methylnaphthalene | NV | **1.7** | J | 0.70 | U | **0.55** | J | 0.64 | U | **2.9** | J | **0.43** | J | 0.73 | U | **6.7** | | **1.3** | J | 0.70 | U | **1.3** | J | **5.0** | J | **14** | J | **5.0** | J | **4.7** | J | **0.63** | J |
| Acenaphthene | 100,000 | **1.3** | J | 0.28 | U | 0.43 | U | 0.26 | U | **11** | | 0.30 | U | 0.29 | U | **3.5** | J | **5.7** | | 0.28 | U | 0.30 | U | **3.9** | J | **42** | | **7.3** | | **7.4** | J | **0.91** | J |
| Acenaphthylene | 100,000 | **2.1** | J | 0.70 | U | 1.1 | U | 0.64 | U | **2.0** | J | 0.75 | U | 0.73 | U | **9.6** | | **2.5** | J | **0.23** | J | 0.76 | U | **23** | | **23** | | **21** | | **32** | | **0.99** | J |
| Anthracene | 100,000 | **3.3** | J | 2.6 | U | 4.1 | U | 2.4 | U | **35** | | 2.8 | U | 2.8 | U | **16** | | **14** | | 2.6 | U | 2.8 | U | **19** | | **69** | | **27** | | **34** | | **2.1** | J |
| Benzo[a]anthracene | 1,000 | **12** | | 2.6 | U | 4.1 | U | 2.4 | U | **84** | | 2.8 | U | 2.8 | U | **91** | | **46** | | 2.6 | U | 2.8 | U | **65** | | **160** | | **68** | | **92** | | **9.2** | |
| Benzo[a]pyrene | 1,000 | **12** | | 2.6 | U | 4.1 | U | 2.4 | U | **75** | | 2.8 | U | 2.8 | U | **100** | | **43** | | 2.6 | U | 2.8 | U | **76** | | **160** | | **72** | | **95** | | **10** | |
| Benzo[b]fluoranthene | 1,000 | **23** | | 2.6 | U | **2.2** | J | 2.4 | U | **110** | | **1.8** | J | 2.8 | U | **170** | | **64** | | 2.6 | U | 2.8 | U | **120** | | **210** | | **110** | | **150** | | **16** | |
| Benzo[g,h,i]perylene | 100,000 | **9.3** | | 2.6 | U | 4.1 | U | 2.4 | U | **44** | | 2.8 | U | 2.8 | U | **80** | | **28** | | 2.6 | U | 2.8 | U | **54** | | **96** | | **52** | | **66** | | **8.5** | |
| Benzo[k]fluoranthene | 1,000 | **6.4** | | 2.6 | U | 4.1 | U | 2.4 | U | **43** | | 2.8 | U | 2.8 | U | **57** | | **22** | | 2.6 | U | 2.8 | U | **37** | | **87** | | **38** | | **46** | | **4.8** | J |
| Chrysene | 1,000 | **18** | | 2.6 | U | **2.0** | J | 2.4 | U | **98** | | **1.5** | J | 2.8 | U | **130** | | **56** | | 2.6 | U | 2.8 | U | **89** | | **190** | | **91** | | **130** | | **12** | |
| Dibenz(a,h)anthracene | 330 | **2.6** | J | 2.6 | U | 4.1 | U | 2.4 | U | **15** | | 2.8 | U | 2.8 | U | **20** | | **8.5** | | 2.6 | U | 2.8 | U | **15** | | **28** | | **14** | | **18** | | **2.1** | J |
| Fluoranthene | 100,000 | **27** | | **1.1** | J | **3.5** | J | 2.4 | U | **160** | | **1.7** | J | 2.8 | U | **190** | | **89** | | 2.6 | U | 2.8 | U | **110** | | **350** | | **120** | | **190** | | **16** | |
| Fluorene | 100,000 | **1.3** | J | 0.70 | U | 1.1 | U | 0.64 | U | **10** | | 0.75 | U | 0.73 | U | **4.5** | J | **5.7** | | 0.70 | U | 0.76 | U | **5.2** | J | **41** | | **8.6** | | **13** | | **0.71** | J |
| Indeno[1,2,3-cd]pyrene | 500 | **8.5** | | 2.6 | U | 4.1 | U | 2.4 | U | **41** | | 2.8 | U | 2.8 | U | **63** | | **26** | | 2.6 | U | 2.8 | U | **48** | | **84** | | **43** | | **54** | | **7.3** | |
| Naphthalene | 100,000 | **1.8** | J | 0.70 | U | **0.82** | J | 0.64 | U | **4.1** | J | **0.84** | J | 0.73 | U | **6.6** | | **1.1** | J | 0.70 | U | **2.3** | J | **8.2** | | **27** | | **4.8** | J | **5** | J | **0.63** | J |
| Phenanthrene | 100,000 | **15** | | 2.6 | U | **2.4** | J | 2.4 | U | **97** | | **1.6** | J | 2.8 | U | **70** | | **50** | | 2.6 | U | 2.8 | U | **38** | | **290** | | **55** | | **93** | | **7.2** | |
| Pyrene | 100,000 | **24** | | 2.6 | U | **2.3** | J | 2.4 | U | **130** | | **1.4** | J | 2.8 | U | **170** | | **77** | | 2.6 | U | 2.8 | U | **98** | | **290** | | **120** | | **190** | | **15** | |
| **Pesticides (8081B) (µg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | 2,600 | 1.7 | U | 1.8 | U | 2.6 | U | 1.7 | U | 1.7 | U | 1.9 | U | 1.8 | U | 1.9 | U | **0.67** | J | 1.8 | U | 1.9 | U | 1.9 | U | 1.7 | U | **0.64** | J | 1.8 | U | 1.8 | U |
| 4,4'-DDE | 1,800 | **0.90** | J | 0.72 | U | 1.1 | U | **0.51** | J | **11** | | 0.75 | U | 0.73 | U | 0.78 | U | **22** | | 0.72 | U | 0.75 | U | 0.75 | U | **0.26** | J | **0.30** | J | 0.71 | U | 0.73 | U |
| 4,4'-DDT | 1,700 | **2.0** | | 1.8 | U | 2.6 | U | **0.82** | J | **27** | | 1.9 | U | 1.8 | U | 19 | U | **53** | | 1.8 | U | 1.9 | U | **1.0** | J | **3.7** | | **1.8** | J | **1.1** | J | 18 | U |
| Aldrin | 19 | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | **0.53** | J | 0.69 | U | **0.57** | J | 0.71 | U | 0.73 | U |
| alpha-BHC | 97 | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| alpha-Chlordane | 910 | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| beta-BHC | 72 | 1.7 | U | 1.8 | U | 2.6 | U | 1.7 | U | 1.7 | U | 1.9 | U | 1.8 | U | 1.9 | U | 1.7 | U | 1.8 | U | 1.9 | U | 1.9 | U | 1.7 | U | 1.7 | U | 1.8 | U | 1.8 | U |
| delta-BHC | 100,000 | 1.0 | U | 1.1 | U | 1.6 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U |
| Dieldrin | 39 | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | **22** | | **9.4** | | **16** | | **9.7** | | 0.73 | U |
| Endosulfan I | 4,800* | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| Endosulfan II | 4,800* | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| Endosulfan sulfate | 4,800* | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| Endrin | 2,200 | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| Endrin aldehyde | NV | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| gamma-BHC (Lindane) | 280 | 1.0 | U | 1.1 | U | 1.6 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U |
| gamma-Chlordane | NV | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | **0.47** | J | 0.68 | U | **0.31** | J | 0.73 | U |
| Heptachlor | 420 | 0.67 | U | 0.72 | U | 1.1 | U | 0.70 | U | 0.67 | U | 0.75 | U | 0.73 | U | 0.78 | U | 0.67 | U | 0.72 | U | 0.75 | U | 0.75 | U | 0.69 | U | 0.68 | U | 0.71 | U | 0.73 | U |
| Heptachlor epoxide | NV | 1.0 | U | 1.1 | U | 1.6 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.2 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U |
| Methoxychlor | NV | 1.0 | U | 1.1 | U | 1.6 | U | 1.0 | U | 1.0 | U | 1.1 | U | 1.1 | U | 12 | U | 1.0 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.0 | U | 1.0 | U | 1.1 | U | 11 | U |
| Toxaphene | NV | 33 | U | 35 | U | 52 | U | 35 | U | 33 | U | 37 | U | 36 | U | 38 | U | 33 | U | 36 | U | 37 | U | 37 | U | 34 | U | 33 | U | 35 | U | 36 | U |
| **PCBs (8082A) (µg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arochlor 1016 | 1,000 | 15 | U | 16 | U | 24 | UJ | 16 | U | 15 | U | 17 | U | 16 | U | 17 | UJ | 15 | U | 16 | U | 17 | U | 17 | U | 16 | U | 15 | U | 16 | U | 16 | U |
| Arochlor 1221 | 1,000 | 17 | U | 18 | U | 27 | UJ | 18 | U | 17 | U | 19 | U | 19 | U | 20 | UJ | 17 | U | 18 | U | 19 | U | 19 | U | 18 | U | 17 | U | 18 | U | 19 | U |
| Arochlor 1232 | 1,000 | 15 | U | 16 | U | 24 | UJ | 16 | U | 15 | U | 17 | U | 16 | U | 17 | UJ | 15 | U | 16 | U | 17 | U | 17 | U | 16 | U | 15 | U | 16 | U | 16 | U |
| Arochlor 1242 | 1,000 | 33 | U | 35 | U | 52 | UJ | 35 | U | 33 | U | 37 | U | 36 | U | 38 | UJ | 33 | U | 36 | U | 37 | U | 37 | U | 34 | U | 33 | U | 35 | U | 36 | U |
| Arochlor 1248 | 1,000 | 20 | U | 21 | U | 32 | UJ | 21 | U | 20 | U | 22 | U | 22 | U | 23 | UJ | 20 | U | 22 | U | 22 | U | 22 | U | 21 | U | 20 | U | 21 | U | 22 | U |
| Arochlor 1254 | 1,000 | 17 | U | 18 | U | 27 | UJ | 18 | U | 17 | U | 19 | U | 19 | U | 20 | UJ | 17 | U | 18 | U | 19 | U | 19 | U | 18 | U | 17 | U | 18 | U | 19 | U |
| Arochlor 1260 | 1,000 | 7.7 | U | 8.2 | U | 12 | UJ | 8.1 | U | **27** | J | 8.6 | U | 8.4 | U | **14** | J | **20** | J | 8.3 | U | 8.7 | U | **42** | | **14** | J | **17** | J | **18** | J | **83** | |

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part 375 6.8(b) Residential | SS017-SB04(2-4) | SS017-SB04(4-6) | SS017-SB04(6-8) | SS017-SB05(0-2) | SS017-SB05(2-4) | SS017-SB05 (4-6) | SS017-SB05(6-8) | SS017-SS06 | SS017-SB06(0-2) | SS017-SB06(2-4) | SS017-SB06(4-6) | SS017-SS07 | SS017-SB07(0-2) | SS017-SB07(2-4) | SS017-SB07(4-6) | SS017-SS08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | | 6/2/2017 | 6/2/2017 | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 |
| Depth to water | | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 9 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 5.5 ft bgs |
| **Metals (6010C/7471A) (mg/kg)** | | | | | | | | | | | | | | | | | |
| Aluminum | NV | **5,400** | **3,500** | **36,000** | **6,400** | **4,900** | **4,600** | **14,000** | **4,900** | **4,100** | **2,800** | **14,000** J | **5,300** | **8,600** | **8,700** | **8,500** | **5,200** |
| Antimony | NV | 1.5 U | 1.5 U | 1.8 U | 1.5 U | 1.4 U | 1.5 U | 1.2 U | 1.5 U | 1.5 U | 1.4 U | 1.5 UJ | 1.5 U | 1.1 U | 1.5 U | 1.5 U | 1.5 U |
| Arsenic | 16 | **2.9** | **1.4** J | **2.9** J | **4.9** | **2.7** | **2.2** J | **5.1** | **3.3** | **1.9** J | **1.2** J | **8.3** | **2.5** | **3.4** | **3.7** | **3.1** | **2.6** |
| Barium | 350 | **22** | **7.9** | **180** | **33** | **19** | **14** | **50** | **25** | **14** | **8.1** | **160** | **24** | **31** | **31** | **29** | **17** |
| Beryllium | 14 | **0.15** J | **0.12** J | **0.82** | **0.26** J | **0.17** J | **0.14** J | **0.56** | **0.26** J | **0.17** J | **0.12** J | **0.86** | **0.20** J | **0.36** J | **0.39** J | **0.39** J | **0.23** J |
| Cadmium | 2.5 | **0.079** J | 0.15 U | **0.095** J | **0.042** J | **0.052** J | **0.046** J | **0.066** J | **0.17** J | 0.15 U | 0.14 U | **0.087** J | **0.31** J | **0.071** J | **0.061** J | **0.071** J | **0.11** J |
| Calcium | NV | **1,000** | **550** | **6,000** | **13,000** | **6,400** | **1,500** | **1,100** | **20,000** | **6,500** | **480** | **3,200** | **2,600** | **5,300** | **14,000** | **6,600** | **1,500** |
| Chromium | NV | **5.4** | **3.4** | **38** | **8.7** | **4.8** | **5.7** | **15** | **12** | **4.5** | **2.8** J | **25** | **7.7** | **10** | **10** | **10** | **5.5** |
| Cobalt | NV | **3.3** | **2.0** | **11** | **5.8** | **2.8** | **2.5** | **8.1** | **3.9** | **2.7** | **2.0** | **11** | **3.2** | **5.5** | **5.5** | **5.6** | **3.3** |
| Copper | 270 | **12** | **5.8** | **7.0** | **26** | **9.4** | **6.4** | **38** | **25** | **10** | **5.8** | **18** | **16** | **23** | **23** | **23** | **13** |
| Iron | NV | **11,000** | **6,300** | **23,000** | **15,000** | **9,400** | **8200** | **26,000** | **10,000** | **8,100** | **5,700** | **25,000** J | **9,400** | **17,000** | **17,000** | **17,000** | **11,000** |
| Lead | 400 | **5.5** | **1.6** | **14** | **3.4** | **2.7** | **2.3** | **7.3** | **21** | **3.1** | **1.2** | **8.0** | **19** | **7.5** | **7.9** | **7.2** | **3.6** |
| Magnesium | NV | **1,500** | **1,000** | **5,500** | **4,300** | **1,600** | **1200** | **4,500** | **3,000** | **1,700** | **1,100** | **5,700** | **1,600** | **3,200** | **3,500** | **3,200** | **1,900** |
| Manganese | 2,000 | **480** | **200** | **160** | **880** | **380** | **180** | **370** | **290** | **260** | **190** | **180** J | **310** | **250** | **250** | **250** | **340** |
| Mercury (µg/kg) | 810 | **12** J | 16 U | **180** | **10** J | **12** J | **22** | **25** | **15** J | **8.1** J | 16 U | **16** J | **33** | **22** | **23** | **23** | **7.1** J |
| Nickel | 140 | **6.5** | **4.3** | **22** | **13** | **5.9** | **5.4** | **19** | **9.8** | **6.2** | **4.2** | **21** | **7.4** | **14** | **13** | **13** | **7.8** |
| Potassium | NV | **510** | **370** | **2,100** | 930 UB | 530 UB | 360 UB | 1,200 UB | **730** | **670** | **410** | 2,200 UB | **590** | **1,100** | **1,300** | **1,300** | **550** |
| Selenium | 36 | 2.9 U | 2.9 U | **1.2** J | 3.1 U | 2.7 U | 3.0 U | 2.4 U | 3.0 U | 2.9 U | 2.9 U | 3.0 U | 3.0 U | 2.2 U | 3.0 U | 3.1 U | 3.1 U |
| Silver | 36 | 0.59 U | 0.59 U | 0.71 U | 0.61 U | 0.55 U | 0.60 U | 0.47 U | 0.59 U | 0.59 U | 0.58 U | 0.60 U | 0.60 U | 0.44 U | 0.60 U | 0.62 U | 0.61 U |
| Sodium | NV | **1,100** | **350** J | **1,400** | 580 UB | **640** | 550 UB | 320 UB | **81** J | **300** J | **220** J | 390 UB | **72** J | **110** J | **130** J | **100** J | **63** J |
| Thallium | NV | 2.4 U | 2.4 U | 3.0 U | 2.5 U | 2.3 U | 2.5 U | 2.0 U | 2.5 U | 2.5 U | 2.4 U | 2.5 U | 2.5 U | 1.8 U | 2.5 U | 2.6 U | 2.6 U |
| Vanadium | NV | **9.1** | **5.5** | **48** | **13** | **8.1** | **8.9** | **21** | **13** | **7.1** | **4.8** | **33** | **10** | **15** | **16** | **15** | **9.2** |
| Zinc | 2,200 | **28** | **14** | **57** | **42** | **20** | **19** | **67** | **110** | **19** | **11** | **52** | **39** | **46** | **45** | **45** | **24** |

Notes:
VOCs = Volatile Organic Compounds; PAHs = Polycyclic Aromatic Hydrocarbons; SIM = Selected Ion Monitoring; PCBs = Polychlorinated Biphenyls; NYCRR = New York Codes, Rules, and Regulations; µg/kg = micrograms per kilogram; mg/kg = milligrams per kilogram; NV = no value
Detections are bolded.
*The sum of Endosulfan I, Endosulfan II, and Endosulfan sulfate.
J-estimated value between the detection limit and limit of quantitation and/or due to quality control issues
U-not detected
UJ-estimated not detected due to quality control issues
UB-considered an artifact of blank contamination
Gray shading exceeds the Residential Soil Cleanup Objective

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part 375 6.8(b) Residential | SS017-SB08(0-2) | SS017-SB08(2-4) | SS017-SB09(0-2) | SS017-SB09(2-4) | SS017-SB09(4-6) | SS017-SS10 | SS017-SB10(0-2) | SS017-SB10(0-2)-a | SS017-SB10(2-4) | SS017-SB10(2-4)-a | SS017-SB10(4-6) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 |
| Depth to water | | 5.5 ft bgs | 5.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs |
| **VOCs (8260B) (µg/kg)** | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 UJ | 1.5 U | 1.5 U | 1.2 U |
| 1,1,1-Trichloroethane | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,1,2,2-Tetrachloroethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 U | 1.5 UJ | 1.5 U | 1.2 U |
| 1,1,2-Trichloroethane | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| 1,1-Dichloroethane | 19,000 | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| 1,1-Dichloroethene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,1-Dichloropropene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,2,3-Trichlorobenzene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,2,3-Trichloropropane | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 UJ | 2.9 UJ | 2.9 UJ | 3.0 U | 2.5 U |
| 1,2,4-Trichlorobenzene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,2,4-Trimethylbenzene | 47,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,2-Dibromo-3-Chloropropane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,2-Dibromoethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,2-Dichlorobenzene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,2-Dichloroethane | 2,300 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,2-Dichloroethene, Total | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,2-Dichloropropane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,3,5-Trimethylbenzene | 47,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,3-Dichlorobenzene | 17,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 1,3-Dichloropropane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 1,4-Dichlorobenzene | 9,800 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 2,2-Dichloropropane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| 2-Butanone (MEK) | 100,000 | 5.5 U | **11** J | 6.6 U | 6.1 U | 6.4 U | 6.3 U | 7.5 U | 5.8 U | 5.8 U | 5.9 U | 5.0 U |
| 2-Chlorotoluene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 2-Hexanone | NV | 11 U | 13 U | 13 U | 12 U | 13 U | 13 U | 15 U | 12 U | 12 U | 12 U | 10 U |
| 4-Chlorotoluene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 4-Isopropyltoluene | NV | 1.4 U | 2.5 UB | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| 4-Methyl-2-pentanone (MIBK) | NV | 11 U | 13 U | 13 U | 12 U | 13 U | 13 U | 15 U | 12 U | 12 U | 12 U | 10 U |
| Acetone | 100,000 | 48 UB | 48 UB | 13 U | 12 U | 13 U | 13 U | 15 U | 12 U | **23** | 12 U | 10 U |
| Benzene | 2,900 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Bromobenzene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| Bromochloromethane | NV | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| Bromodichloromethane | NV | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| Bromoform | NV | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| Bromomethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Carbon disulfide | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Carbon tetrachloride | 1,400 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Chlorobenzene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Chloroethane | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Chloroform | 10,000 | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| Chloromethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| cis-1,2-Dichloroethene | 59,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| cis-1,3-Dichloropropene | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Dibromochloromethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Dibromomethane | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Dichlorodifluoromethane | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Ethylbenzene | 30,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Hexachlorobutadiene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| Isopropyl ether | NV | 6.8 UJ | 8.0 UJ | 8.3 U | 7.6 U | 8.0 U | 7.8 U | 9.4 U | 7.3 U | 7.3 U | 7.4 U | 6.2 U |
| Isopropylbenzene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| m&p-Xylene | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Methyl iodide | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Methyl tert-butyl ether | 62,000 | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| Methylene Chloride | 51,000 | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Naphthalene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| n-Butylbenzene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| N-Propylbenzene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| o-Xylene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| sec-Butylbenzene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| Styrene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| tert-Butylbenzene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 UJ | 1.5 UJ | 1.5 UJ | 1.5 U | 1.2 U |
| Tetrachloroethene | 5,500 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Toluene | 100,000 | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| trans-1,2-Dichloroethene | 100,000 | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part 375 6.8(b) Residential | SS017-SB08(0-2) | SS017-SB08(2-4) | SS017-SB09(0-2) | SS017-SB09(2-4) | SS017-SB09(4-6) | SS017-SS10 | SS017-SB10(0-2) | SS017-SB10(0-2)-a | SS017-SB10(2-4) | SS017-SB10(2-4)-a | SS017-SB10(4-6) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 |
| Depth to water | | 5.5 ft bgs | 5.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs |
| trans-1,3-Dichloropropene | NV | 1.4 U | 1.6 U | 1.7 U | 1.5 U | 1.6 U | 1.6 U | 1.9 U | 1.5 U | 1.5 U | 1.5 U | 1.2 U |
| Trichloroethene | 10,000 | 0.68 U | 0.80 U | 0.83 U | 0.76 U | 0.80 U | 0.78 U | 0.94 U | 0.73 U | 0.73 U | 0.74 U | 0.62 U |
| Trichlorofluoromethane | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Vinyl acetate | NV | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Vinyl chloride | 210 | 2.7 U | 3.2 U | 3.3 U | 3.0 U | 3.2 U | 3.1 U | 3.8 U | 2.9 U | 2.9 U | 3.0 U | 2.5 U |
| Xylenes (total) | 100,000 | 0.85 U | 1.0 U | 1.0 U | 0.95 U | 1.0 U | 0.98 U | 1.2 U | 0.91 U | 0.91 U | 0.92 U | 0.78 U |
| **PAHs (8270D SIM) (µg/kg)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | NV | **0.79** J | **0.88** J | **35** | 0.54 U | **0.30** J | **9.4** | **510** | **9.5** | **150** J | **39** J | **3.4** J |
| 2-Methylnaphthalene | NV | **1.2** J | **1.3** J | **41** J | 0.72 U | **0.46** J | **12** | **630** | **11** | **170** J | **49** J | **4.6** J |
| Acenaphthene | 100,000 | **0.98** J | 0.32 U | **30** J | 0.29 U | 0.30 U | **4.7** J | **360** J | **19** J | **4.3** J | **11** J | 0.28 U |
| Acenaphthylene | 100,000 | **3.1** J | **0.95** J | **9.4** J | **0.27** J | **0.32** J | **6.4** | **120** J | **10** J | 0.71 U | **6.7** | 0.69 U |
| Anthracene | 100,000 | **4.5** J | 3.0 U | **81** J | 2.7 U | 2.9 U | **12** | **1,100** J | **54** J | **13** J | **30** J | 2.6 U |
| Benzo[a]anthracene | 1,000 | **11** | **1.2** J | **340** | 2.7 U | 2.9 U | **51** | **2,300** J | **170** J | **23** J | **100** J | 2.6 U |
| Benzo[a]pyrene | 1,000 | **12** | **1.3** J | **310** | **0.84** J | **1.1** J | **59** | **1,600** J | **150** J | **12** J | **89** J | 2.6 U |
| Benzo[b]fluoranthene | 1,000 | **18** | **2.3** J | **460** | 2.7 U | **2.6** J | **82** | **2,300** | **220** | **23** J | **140** J | 2.6 U |
| Benzo[g,h,i]perylene | 100,000 | **8.9** | **1.4** J | **170** J | 2.7 U | 2.9 U | **40** | **710** J | **86** J | **7.4** J | **52** J | 2.6 U |
| Benzo[k]fluoranthene | 1,000 | **5.1** J | 3.0 U | **160** J | 2.7 U | 2.9 U | **29** | **910** J | **75** J | **3.9** J | **48** J | 2.6 U |
| Chrysene | 1,000 | **15** | **1.9** J | **420** | **1.1** J | **1.9** J | **69** | **2,600** | **200** | **67** J | **130** J | **1.2** J |
| Dibenz(a,h)anthracene | 330 | **2.5** J | 3.0 U | **57** J | 2.7 U | 2.9 U | **10** | **290** J | **27** J | **3.4** J | **18** J | 2.6 U |
| Fluoranthene | 100,000 | **22** | **2.7** J | **720** | **1.3** J | **2.2** J | **96** | **5,000** | **340** | **23** J | **190** J | 2.6 U |
| Fluorene | 100,000 | **1.8** J | **1.4** J | **27** J | 0.72 U | 0.76 U | **5.2** J | **400** J | **20** J | **5.7** J | **10** J | 0.69 U |
| Indeno[1,2,3-cd]pyrene | 500 | **7.6** | 3.0 U | **160** J | 2.7 U | 2.9 U | **31** | **710** J | **76** J | **4.6** J | **48** J | 2.6 U |
| Naphthalene | 100,000 | **1.2** J | **1.1** J | **26** | 0.72 U | **0.61** J | **8.1** | **490** | **8.3** | **97** J | **33** J | **2.9** J |
| Phenanthrene | 100,000 | **12** | **1.5** J | **360** | 2.7 U | **1.6** J | **50** | **3,800** J | **210** J | **130** | **120** | **2.8** J |
| Pyrene | 100,000 | **21** | **1.9** J | **600** | **1.2** J | **2.0** J | **87** | **3,900** | **280** | **27** J | **160** J | 2.6 U |
| **Pesticides (8081B) (µg/kg)** | | | | | | | | | | | | |
| 4,4'-DDD | 2,600 | 1.9 UJ | 2.0 UJ | 1.8 U | 1.7 U | 1.8 U | 1.9 U | **6.5** J | 1.8 U | **1.6** J | **3.8** J | 1.8 U |
| 4,4'-DDE | 1,800 | 0.75 UJ | 0.82 UJ | **24** J | 0.69 U | 0.72 U | **0.73** J | **3.9** J | 0.72 U | 0.74 U | **1.4** J | 0.71 U |
| 4,4'-DDT | 1,700 | **0.76** J | **3.2** J | **44** J | 1.7 U | 1.8 U | 19 U | **9.1** J | 18 U | **0.68** J | **4.0** J | 1.8 U |
| Aldrin | 19 | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| alpha-BHC | 97 | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| alpha-Chlordane | 910 | **1.7** J | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| beta-BHC | 72 | 1.9 UJ | 2.0 UJ | 1.8 U | 1.7 U | 1.8 U | 1.9 U | 1.9 U | 1.8 U | 1.8 U | 1.9 U | 1.8 U |
| delta-BHC | 100,000 | 1.1 UJ | 1.2 UJ | 1.1 U | 1.0 U | 1.1 U | 1.1 U | 1.1 U | 1.1 U | 1.1 U | 1.2 U | 1.1 U |
| Dieldrin | 39 | **7.0** J | **1.1** J | 0.72 U | 0.69 U | 0.72 U | **2.3** | 0.75 U | **1.2** J | 0.74 U | 0.77 U | 0.71 U |
| Endosulfan I | 4,800* | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| Endosulfan II | 4,800* | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| Endosulfan sulfate | 4,800* | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.32 J | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| Endrin | 2,200 | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| Endrin aldehyde | NV | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| gamma-BHC (Lindane) | 280 | 1.1 UJ | 1.2 UJ | 1.1 U | 1.0 U | 1.1 U | 1.1 U | 1.1 U | 1.1 U | 1.1 U | 1.2 U | 1.1 U |
| gamma-Chlordane | NV | **0.83** J | 0.82 UJ | **0.28** J | 0.69 U | 0.72 U | 0.75 U | **1.8** J | 0.72 U | 0.74 U | **0.53** J | 0.71 U |
| Heptachlor | 420 | 0.75 UJ | 0.82 UJ | 0.72 U | 0.69 U | 0.72 U | 0.75 U | 0.75 U | 0.72 U | 0.74 U | 0.77 U | 0.71 U |
| Heptachlor epoxide | NV | 1.1 UJ | 1.2 UJ | 1.1 U | 1.0 U | 1.1 U | 1.1 U | 1.1 U | 1.1 U | 1.1 U | 1.2 U | 1.1 U |
| Methoxychlor | NV | 1.1 UJ | 1.2 UJ | 1.1 U | 1.0 U | 1.1 U | 11 U | 1.1 U | 11 U | 1.1 U | 1.2 U | 1.1 U |
| Toxaphene | NV | 37 UJ | 40 UJ | 35 U | 34 U | 36 U | 37 U | 37 U | 35 U | 36 U | 38 U | 35 U |
| **PCBs (8082A) (µg/kg)** | | | | | | | | | | | | |
| Arochlor 1016 | 1,000 | 17 U | 18 UJ | 16 U | 15 U | 16 U | 17 U | 17 U | 16 U | 16 U | 17 U | 16 U |
| Arochlor 1221 | 1,000 | 19 U | 21 U | 18 U | 17 U | 18 U | 19 U | 19 U | 18 U | 19 U | 20 U | 18 U |
| Arochlor 1232 | 1,000 | 17 U | 18 U | 16 U | 15 U | 16 U | 17 U | 17 U | 16 U | 16 U | 17 U | 16 U |
| Arochlor 1242 | 1,000 | 37 U | 40 U | 35 U | 34 U | 36 U | 37 U | 37 U | 35 U | 36 U | 38 U | 35 U |
| Arochlor 1248 | 1,000 | 22 U | 24 U | 21 U | 20 U | 22 U | 22 U | 22 U | 21 U | 22 U | 23 U | 21 U |
| Arochlor 1254 | 1,000 | 19 U | 21 U | 18 U | 17 U | 18 U | 19 U | 19 U | 18 U | 19 U | 20 U | 18 U |
| Arochlor 1260 | 1,000 | 8.6 U | 9.4 UJ | **220** | 7.9 U | 8.3 U | **50** | **100** J | **24** J | **4.9** J | **37** J | 8.2 U |

**Table 1**
**Soil Analytical Results Compared to 6 NYCRR Part 375 Residential SCOs**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Sample Identification | NYCRR Part 375 6.8(b) Residential | SS017-SB08(0-2) | SS017-SB08(2-4) | SS017-SB09(0-2) | SS017-SB09(2-4) | SS017-SB09(4-6) | SS017-SS10 | SS017-SB10(0-2) | SS017-SB10(0-2)-a | SS017-SB10(2-4) | SS017-SB10(2-4)-a | SS017-SB10(4-6) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample date | | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/2/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 | 6/1/2017 |
| Depth to water | | 5.5 ft bgs | 5.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs | 6.5 ft bgs |
| **Metals (6010C/7471A) (mg/kg)** | | | | | | | | | | | | |
| Aluminum | NV | **7,400** | **5,500** | **4,100** J | **3,700** | **7,000** | **4,200** | **6,400** | **4,700** | **3,800** J | **10,000** J | **8,800** |
| Antimony | NV | 1.2 U | 1.5 U | 1.5 UJ | 1.5 U | 1.7 U | 1.3 U | 1.3 U | 1.2 U | 1.5 U | 1.2 U | 1.3 U |
| Arsenic | 16 | **3.0** | **2.1** J | **2.2** J | **1.9** J | **2.2** J | **2.0** J | **4.5** | **4.9** | **7.2** J | **3.1** J | **4.6** |
| Barium | 350 | **40** | **20** | **14** | **13** | **16** | **18** | **39** J | **18** J | **21** J | **83** J | **48** |
| Beryllium | 14 | **0.34** J | **0.19** J | **0.17** J | **0.16** J | **0.16** J | **0.20** J | **0.29** J | **0.20** J | **0.26** J | **0.60** J | **0.33** J |
| Cadmium | 2.5 | **0.14** J | **0.044** J | **0.084** J | 0.15 U | **0.063** J | **0.11** J | **0.12** J | **0.084** J | 0.15 U | **0.051** J | **0.041** J |
| Calcium | NV | **4,400** | **1,200** | **1,000** | **670** | **620** | **10,000** | **13,000** | **9,000** | **850** J | **1,800** J | **21,000** |
| Chromium | NV | **10** | **5.5** | **4.7** | **3.7** | **5.3** | **7.4** | **8.3** | **6.0** | **4.7** J | **12** J | **15** |
| Cobalt | NV | **5.3** | **3.1** | **2.7** | **2.5** | **2.8** | **3.1** | **4.7** | **3.6** | **6.6** | **5.3** | **6.5** |
| Copper | 270 | **15** | **9.2** | **9.2** | **7.5** | **6.6** | **10** | **19** | **13** | **15** | **17** | **30** |
| Iron | NV | **15,000** | **8,900** | **8,500** J | **7,200** | **7,500** | **8,800** | **17,000** J | **10,000** J | **16,000** | **19,000** | **20,000** |
| Lead | 400 | **9.7** | **2.4** | **4.9** | **1.6** | **2.9** | **9.2** | **8.6** | **6.8** | **6.0** | **5.6** | **5.1** |
| Magnesium | NV | **2,800** | **1,500** | **1,500** | **1,300** | **1,100** | **2,000** | **2,400** | **2,000** | **1,200** J | **3,100** J | **5,600** |
| Manganese | 2,000 | **300** | **280** | **250** J | **240** | **120** | **240** | **400** | **290** | **130** | **180** | **800** |
| Mercury (µg/kg) | 810 | **25** | **16** J | **24** | **7.2** J | **32** | **9.0** J | **40** J | **16** J | **20** | **17** J | **16** J |
| Nickel | 140 | **11** | **6.8** | **6.5** | **5.2** | **5.7** | **6.9** | **12** | **7.2** | **12** | **13** | **15** |
| Potassium | NV | **950** | **580** | **540** | **530** | **370** | **640** | **790** | **610** | **500** | **770** | **1,100** |
| Selenium | 36 | 2.5 U | 3.0 U | 3.0 U | 3.0 U | 3.3 U | 2.5 U | 2.7 U | 2.3 U | 3.0 U | 2.3 U | 2.6 U |
| Silver | 36 | 0.50 U | 0.59 U | 0.61 U | 0.59 U | 0.66 U | 0.51 U | 0.54 U | 0.46 U | 0.60 U | 0.47 U | 0.52 U |
| Sodium | NV | **460** | **480** J | **130** J | **190** J | **370** J | **58** J | **180** J | **64** J | **110** J | **190** J | **130** J |
| Thallium | NV | 2.1 U | 2.5 U | 2.5 U | 2.5 U | 2.8 U | 2.1 U | 2.2 U | 1.9 U | 2.5 U | 1.9 U | 2.2 U |
| Vanadium | NV | **14** | **8.1** | **7.2** | **6.2** | **9.9** | **8.4** | **12** | **8.6** | **7.8** J | **19** J | **15** |
| Zinc | 2,200 | **34** | **20** | **22** J | **14** | **25** | **48** | **35** | **34** | **15** J | **37** J | **54** |

Notes:
VOCs = Volatile Organic Compounds; PAHs = Polycyclic Aromatic Hydrocarbons; SIM = Selected Ion Monitoring; PCBs = Polychlorinated Biphenyls; NYCRR = New York Codes, Rules, and Regulations; µg/kg = micrograms per kilogram; mg/kg = milligrams per kilogram; NV = no value
Detections are bolded.
*The sum of Endosulfan I, Endosulfan II, and Endosulfan sulfate.
J-estimated value between the detection limit and limit of quantitation and/or due to quality control issues
U-not detected
UJ-estimated not detected due to quality control issues
UB-considered an artifact of blank contamination
Gray shading exceeds the Residential Soil Cleanup Objective

**Table 2**
**Comparison of Percentage of PAHs in Sealcoat to Sample SS017-SB03 Results**
**Site SS017 (Lot 69 Hazardous Waste Storage Area)**
**Former Griffiss AFB Rome, New York**

| Polycyclic aromatic hydrocarbons | CAS # | Sealcoat (mg PAH/kg sealcoat) | SS017-SB03 (collected 0-2 feet below ground surface) mg/kg | % of Total PAHs in Sealcoat | % Total PAHs in SS017-SB03 |
|---|---|---|---|---|---|
| Acenaphthene | 83-32-9 | 2,433 | 3.2 | 5% | 1% |
| Acenaphthylene | 208-96-8 | BDL | 0.27 | 0% | 0% |
| Anthracene | 120-12-7 | 1,582 | 7.2 | 4% | 3% |
| Benz[a]anthracene | 53-55-3 | 1,325 | 19 | 3% | 8% |
| Benzo[a]pyrene | 50-32-8 | 1,906 | 17 | 4% | 7% |
| Benzo[b]fluoranthene | 205-99-2 | 1,407 | 23 | 3% | 10% |
| Benzo[g,h,i]perylene | 191-24-2 | 958 | 9 | 2% | 4% |
| Benzo[k]fluoranthene | 207-08-9 | 784 | 7.7 | 2% | 3% |
| Biphenyl | 92-52-4 | 87 | 0 | 0% | 0% |
| Chrysene | 218-01-9 | 2,409 | 23 | 5% | 10% |
| Dibenz[a,h]anthracene | 53-70-3 | 151 | 3 | 0% | 1% |
| Fluoranthene | 206-44-0 | 8,706 | 42 | 20% | 18% |
| Fluorene | 86-73-7 | 1,867 | 3 | 4% | 1% |
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 682 | 8.4 | 2% | 4% |
| 1-Methylnaphthalene | 90-12-0 | 201 | 0.43 | 0% | 0% |
| 2-Methylnaphthalene | 91-57-6 | 351 | 0.52 | 1% | 0% |
| Naphthalene | 91-20-3 | 725 | 0.97 | 2% | 0% |
| Phenanthrene | 85-01-8 | 11,850 | 30 | 27% | 13% |
| Pyrene | 129-00-0 | 6,820 | 34 | 15% | 15% |
| **Total** | | **44,242** | **232** | | |

**Notes:**

CAS # = Chemical abstract service number

BDL = below detection limit

mg = milligrams

kg = kilograms

PAH results for sealcoat obtained from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4979669/

# FIGURES

# Former Griffiss AFB Site Location Map

**Figure 1**

Supplemental Site Investigation Report
SS017 (Lot 69 - Hazardous Waste Storage Area)
Former Griffiss Air Force Base, Rome, New York

DRAWN BY: MRM

DATE: 6/10/2019

SCALE: As Shown

PROJECT NO: AFCGSA3.0012.00AA.2020.0002

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Site Map

Figure 2

Supplemental Site Investigation Report
SS017 (Lot 69 - Hazardous Waste Storage Area)
Former Griffiss Air Force Base, Rome, New York

DRAWN BY: MRM

DATE: 6/10/2019

SCALE: As Shown

PROJECT NO: AFCGSA3.0012.00AA.2020.0002

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Notes:
This information is depicted to provide visual aid within the context of this document and should not be used as a sole reference in precise dimensioning of features indicated. Please verify the location of all features including underground and aboveground utilities prior to conducting any subsurface exploration or site assessment.

0 50 100 200 Feet

Legend:
- Installation Restoration Program (IRP) Area
- Parcel Boundary
- 5657 Building Number
- 0781 Demolished Building Location

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

| SS017-SB03 | | | |
|---|---|---|---|
| **Parameter** | **Depth Interval** | **Result (µg/kg)** | **NYCRR (µg/kg)** |
| **PAHs** | | | |
| Benzo(a)anthracene | 0-2' | 19,000 J | 1,000 |
| Benzo(a)pyrene | 0-2' | 17,000 J | 1,000 |
| Benzo(b)fluoranthene | 0-2' | 23,000 J | 1,000 |
| Benzo(k)fluoranthene | 0-2' | 7,700 J | 1,000 |
| Chrysene | 0-2' | 23,000 J | 1,000 |
| Dibenz(a,h)anthracene | 0-2' | 3,000 J | 330 |
| Indeno(1,2,3-cd)pyrene | 0-2' | 8,400 J | 500 |

| SS017-SB10 | | | |
|---|---|---|---|
| **Parameter** | **Depth Interval** | **Result (µg/kg)** | **NYCRR (µg/kg)** |
| **PAHs** | | | |
| Benzo(a)anthracene | 0-2' | 2,300 J | 1,000 |
| Benzo(a)pyrene | 0-2' | 1,600 J | 1,000 |
| Benzo(b)fluoranthene | 0-2' | 2,300 | 1,000 |
| Chrysene | 0-2' | 2,600 | 1,000 |
| Indeno(1,2,3-cd)pyrene | 0-2' | 710 J | 500 |

Notes:

**PAHs** - Polycyclic Aromatic Hydrocarbons

**NYCRR -** New York Codes, Rules and Regulations

**SCO** - Soil Cleanup Objectives

**µg/kg** - micrograms per kilogram

**J -** Estimated detection

' - feet

Notes:
This information is depicted to provide visual aid within the context of this document and should not be used as a sole reference in precise dimensioning of features indicated. Please verify the location of all features including underground and aboveground utilities prior to conducting any subsurface exploration or site assessment.

0 50 100 200 Feet

Legend:

- Sample Locations
- Installation Restoration Program (IRP) Area
- Parcel Boundary
- 5657 Building Number
- 0781 Demolished Building Location

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sample Locations and NYCRR Residential SCO Exceedances

Figure 3

Supplemental Site Investigation Report
SS017 (Lot 69 - Hazardous Waste Storage Area)
Former Griffiss Air Force Base, Rome, New York

DRAWN BY: MRM

DATE: 6/10/2019

SCALE: As Shown

PROJECT NO: AFCGSA3.0012.00AA.2020.0002

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# APPENDIX A
# SOIL BORING LOGS (SS017-SB01 THROUGH –SB10)

# BORING NUMBER SS017-SB01



**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1175061.01 **EASTING:** 1133917.32
**GROUND ELEVATION** 466.50 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 9.0 ft / Elev 457.5 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following ontervals: 0-2, 2-4, 4-6, and 6-8 feet below ground surface. Insufficient soil volume to collect sample from 8.0-9.0 feet below ground surface. | | | Apshalt<br>0.5 — 466.0 | |
| | | | GP | | Road Base Fill<br>1.0 — 465.5 | 2.3 |
| | | | SM | | Silty Sand, brown (7.5YR 4/3), moist, loose, medium to coarse grained sand, subangular, trace gravel inclusions up to 0.5".<br>2.0 — 464.5 | |
| 2.5 | | | SM | | Silty Sand, strong brown (7.5YR 4/6), moist, loose, medium to coarse grained sand, subangular.<br>5.0 — 461.5 | 1.0 |
| 5.0 | | | SM | | Silty Sand, strong brown (7.5YR 4/6), moist, loose, medium to coarse grained sand, subangular, trace gravel inclusions up to 0.5".<br>7.0 — 459.5 | |
| 7.5 | | | CL | | Silty Clay, gray (7.5YR 5/1), medium plasticity, moist, organics (roots).<br>8.0 — 458.5 | |
| | | | SP | ▽ | Sand, strong brown (7.5YR 4/6), moist to saturated, loose, medium grained sand, subangular, gravel inclusions up to 0.5". | |
| 10.0 | | | | | 10.0 — 456.5 | |

Bottom of hole at 10.0 feet.

BHATE ENVIRONMENTAL ASSOCIATES GAFB - SS017.GPJ GINT US LAB.GDT 7/12/17

# BORING NUMBER SS017-SB02



bhate

**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/2/17 **COMPLETED** 6/2/17
**NORTHING:** 1175236.18 **EASTING:** 1133956.69
**GROUND ELEVATION** 466.66 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 9.0 ft / Elev 457.7 ft
**LOGGED BY** J. Geroux
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, 4-6, and 6-8 feet below ground surface. Insufficient soil volume to collect sample from 8.0-9.0 feet below ground surface. | | | Apshalt<br>0.5 466.2 | |
| | | | GP | | Road Base Fill<br>1.0 465.7 | 7.8 |
| 2.5 | | | SP | | Sand, brown (7.5YR 4/4), moist, loose, fine grained sand, subangular, trace gravel inclusions up to 0.25". | 5.2 |
| 5.0 | | | | | | 4.6 |
| 7.5 | | | | | | 7.9 |
| | | | SM | | Silty Sand, black (7.5YR 2.5/1), moist, loose, medium grained sand, subangular, organics (roots).<br>▽ 9.0 457.7 | 3.3 |
| 10.0 | | | SM | | Silty Sand, brown (7.5YR 5/2), saturated, loose, medium to coarse grained sand, subangular, trace gravel inclusions up to 1.5".<br>10.0 456.7 | |

Bottom of hole at 10.0 feet.

# BORING NUMBER SS017-SB03



bhate

**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/2/17 **COMPLETED** 6/2/17
**NORTHING:** 1175304.96 **EASTING:** 1134082.11
**GROUND ELEVATION** 466.68 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 9.0 ft / Elev 457.7 ft
**LOGGED BY** J. Geroux
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | | PID (ppm) |
|---|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, 4-6, and 6-8 feet below ground surface. Insufficient soil volume to collect sample from 8.0-9.0 feet below ground surface. | | | Apshalt | 466.2 | |
| | | | | | 0.5 | | |
| | | | GP | | Road Base Fill | 465.7 | 7.5 |
| | | | | | 1.0 | | |
| | | | SP | | Sand, dark brown (7.5YR 3/4), moist, loose, fine grained sand, subangular, trace gravel inclusions up to 0.25". | | |
| 2.5 | | | | | | | 1.9 |
| | | | | | 3.0 | 463.7 | |
| | | | SP | | Sand, brown (7.5YR 4/4), moist, loose, fine grained sand, subangular, trace gravel inclusions up to 0.25". | | |
| 5.0 | | | | | | | 2.0 |
| | | | | | 7.0 | 459.7 | |
| | | | SM | | Silty Sand, brown (7.5YR 4/4), moist, loose, medium grained sand, subangular, trace mottling. | | 3.2 |
| 7.5 | | | | | | | |
| | | | | | 8.5 | 458.2 | |
| | | | SP | | ▽ Sand, strong brown (7.5YR 4/4), moist to saturated, loose, fine grained sand, subangular, gravel inclusions up to 0.5". | | 0.9 |
| 10.0 | | | | | 10.0 | 456.7 | |

Bottom of hole at 10.0 feet.

BHATE ENVIRONMENTAL ASSOCIATES GAFB - SS017.GPJ GINT US LAB.GDT 7/12/17

# BORING NUMBER SS017-SB04



**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/2/17 **COMPLETED** 6/2/17
**NORTHING:** 1175232.01 **EASTING:** 1134180.64
**GROUND ELEVATION** 466.52 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 9.0 ft / Elev 457.5 ft
**LOGGED BY** J. Geroux
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, 4-6, and 6-8 feet below ground surface. Insufficient soil volume to collect sample from 8.0-9.0 feet below ground surface. | | | Apshalt<br>0.5 — 466.0 | |
| | | | GP | | Road Base Fill<br>1.0 — 465.5 | 4.8 |
| 2.5 | | | SM | | Silty Sand, dark brown (7.5YR 3/4), moist, loose, fine grained sand, subangular, gravel inclusions up to 1.0".<br>4.5 — 462.0 | 1.6 |
| 5.0 | | | SM | | Silty Sand, dark brown (7.5YR 7/4), moist, loose, fine grained, subangular, gravel inclusions up to 0.25".<br>6.0 — 460.5 | 1.8 |
| 7.5 | | | SP | | Sand, black (7.5YR 2.5/1), moist, loose, fine grained sand, subangular.<br>8.0 — 458.5 | 1.8 |
| | | | SP | | Sand, strong brown (7.5YR 4/4), moist, loose, fine grained sand, subangular, gravel inclusions up to 0.5".<br>▽ 9.0 — 457.5 | 1.6 |
| 10.0 | | | SP | | Sand, brown (7.5YR 4/4), saturated, loose, coarse grained sand, subangular, gravel includions up to 1.5".<br>10.0 — 456.5 | |

Bottom of hole at 10.0 feet.

# BORING NUMBER SS017-SB05



**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1175057.43 **EASTING:** 1134231.48
**GROUND ELEVATION** 466.40 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
**AT TIME OF DRILLING** 9.0 ft / Elev 457.4 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, 4-6, and 6-8 feet below ground surface. Insufficient soil volume to collect sample from 8.0-9.0 feet below ground surface. | | | Apshalt<br>0.5 — 465.9 | |
| | | | GP | | Road Base Fill<br>1.0 — 465.4 | 3.8 |
| 2.5 | | | SM | | Silty Sand, brown (7.5YR 4/3), moist, loose, fine grained sand, subangular, gravel inclusions up to 0.5".<br>4.0 — 462.4 | 3.9 |
| 5.0 | | | SM | | Silty Sand, dark brown (7.5YR 3/2), moist, loose, fine grained, subangular, gravel inclusions up to 0.25", lone cobble inclusion over 3".<br>6.0 — 460.4 | 4.6 |
| 7.5 | | | SP | | Sand, dark brown, (7.5YR 3/2), moist to saturated, loose, coarse grained sand, subangular, gravel inclusions up to 1.0". | 9.6 |
| 10.0 | | | | | 10.0 — 456.4 | |

Bottom of hole at 10.0 feet.

BHATE ENVIRONMENTAL ASSOCIATES GAFB - SS017.GPJ GINT US LAB.GDT 7/12/17

# BORING NUMBER SS017-SB06



bhate

**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1175307.03 **EASTING:** 1134277.45
**GROUND ELEVATION** 464.60 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 6.5 ft / Elev 458.1 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, and 4-6 feet below ground surface. Insufficient soil volume to collect sample from 6.0-6.5 feet below ground surface. | | | Apshalt<br>0.5 464.1 | |
| | | | GP | | Road Base Fill<br>1.0 463.6 | 3.8 |
| | | | SM | | Silty Sand, brown (7.5YR 4/3), moist, loose, fine grained sand, subangular, gravel inclusions up to 0.5".<br>2.0 462.6 | |
| 2.5 | | | SM | | Silty Sand, dark brown (7.5YR 3/2), moist, loose, fine grained, subangular, trace organics (roots).<br>3.5 461.1 | 3.9 |
| | | | CL | | Silty Clay, brown (7.5YR 4/3), medium plasticity, moist, mottling, organics (roots).<br>5.0 459.6 | 4.6 |
| 5.0 | | | | | | |
| 7.5 | | | CL | | Silty Clay, brown (7.5YR 4/3), moist to saturated, non-plastic, mottling, organics (roots). ▽ | 9.6 |
| 10.0 | | | | | 10.0 454.6 | |

Bottom of hole at 10.0 feet.

# BORING NUMBER SS017-SB07



bhate

**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1175162.15 **EASTING:** 1134401.97
**GROUND ELEVATION** 465.01 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
**AT TIME OF DRILLING** 6.5 ft / Elev 458.5 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, and 4-6 feet below ground surface. Insufficient soil volume to collect sample from 6.0-6.5 feet below ground surface. | | | Apshalt 0.5 464.5 | |
| | | | GP | | Road Base Fill 1.0 464.0 | 1.8 |
| | | | SM | | Silty Sand, dark brown (7.5YR 3/2), moist, loose, fine grained sand, subangular, gravel inclusions up to 1.0". 2.0 463.0 | |
| 2.5 | | | SW | | Sand, brown (7.5YR 5/2), moist, loose, medium to coarse grained, subangular, gravel includions up to 1.0". 3.0 462.0 | 1.9 |
| | | | SW | | Sand, brown (7.5YR 4/2), moist, loose, medium to coarse grained, subangular, gravel includions up to 1.0". 5.0 460.0 | |
| 5.0 | | | | | | 4.6 |
| 7.5 | | | SP | | Sand, gray (7.5YR 5/1), moist to saturated, loose, medium grained, subangular, gravel includions up to 0.75". | |
| 10.0 | | | | | 10.0 455.0 | |

Bottom of hole at 10.0 feet.

BHATE ENVIRONMENTAL ASSOCIATES GAFB - SS017.GPJ GINT US LAB.GDT 7/12/17

# BORING NUMBER SS017-SB08



bhate

**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1175304.94 **EASTING:** 1134486.13
**GROUND ELEVATION** 463.22 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 5.5 ft / Elev 457.7 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2 and 2-4 feet below ground surface. Insufficient soil volume to collect sample from 4.0-5.5 feet below ground surface. | | | Apshalt 0.5 462.7 | |
| | | | GP | | Road Base Fill 1.0 462.2 | 1.1 |
| | | | SM | | Silty Sand, dark brown (7.5YR 3/3), moist, medium plasticity, fine grained sand, subangular, gravel inclusions up to 0.5". 2.0 461.2 | |
| 2.5 | | | CL | | Silty Clay, gray (7.5YR 5/1), moist, non-plastic, fine grained sand, subangular, gravel inclusions up to 0.5", organics (roots). 3.0 460.2 | 2.6 |
| | | | SM | | Silty Sand, dark brown (7.5YR 3/3), moist, medium plasticity, fine grained sand, subangular, gravel inclusions up to 0.5", organics (roots). 3.9 459.3 | |
| 5.0 | | | CL | | Silty Clay, dark brown (7.5YR 2.5/1), moist to saturated, medium plasticity. ▽ | |
| 7.5 | | | | | | |
| 10.0 | | | | | 10.0 453.2 | |

Bottom of hole at 10.0 feet.

# BORING NUMBER SS017-SB09



**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1175064.68 **EASTING:** 1134549.11
**GROUND ELEVATION** 464.79 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
**AT TIME OF DRILLING** 6.5 ft / Elev 458.3 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, and 4-6 feet below ground surface. Insufficient soil volume to collect sample from 6.0-6.5 feet below ground surface. | | | Apshalt<br>0.5 464.3 | |
| | | | GP | | Road Base Fill<br>1.0 463.8 | 0.8 |
| | | | SM | | Silty Sand, brown (7.5YR 4/4), moist, loose, fine grained sand, subangular, gravel inclusions up to 0.5".<br>2.0 462.8 | |
| 2.5 | | | SM | | Silty Sand, brown (7.5YR 4/4), moist, loose, fine grained sand, subangular.<br>4.0 460.8 | 1.7 |
| 5.0 | | | SM | | Silty Sand, brown (7.5YR 4/4), moist, loose, fine grained sand, subangular, trace mottling. | 1.4 |
| 7.5 | | | | | | |
| 10.0 | | | | | 10.0 454.8 | |

Bottom of hole at 10.0 feet.

# BORING NUMBER SS017-SB10



bhate

**CLIENT** AFCEC
**PROJECT NAME** SS017
**PROJECT NUMBER** AFCGSA3.0012.00AA.2020.0002
**PROJECT LOCATION** Former Griffiss AFB - Rome, NY
**DATE STARTED** 6/1/17 **COMPLETED** 6/1/17
**NORTHING:** 1174962.47 **EASTING:** 1134579.43
**GROUND ELEVATION** 464.16 ft feet **HOLE SIZE** 3.75
**DRILLING CONTRACTOR** Aztech Environmental
**GROUND WATER LEVELS:**
**DRILLING METHOD** Direct Push
▽ **AT TIME OF DRILLING** 6.5 ft / Elev 457.7 ft
**LOGGED BY** S. Liberatore
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | REMARKS | U.S.C.S. | GRAPHIC LOG | MATERIAL DESCRIPTION | PID (ppm) |
|---|---|---|---|---|---|---|
| 0.0 | | Soil Samples for offsite analysis collected from the following intervals: 0-2, 2-4, and 4-6 feet below ground surface. Insufficient soil volume to collect sample from 6.0-6.5 feet below ground surface. | SM | | Silty Sand, dark brown (7.5YR 3/3), moist, loose, fine grained sand, subangular, trace gravel inclusions up to 0.5", organics (roots). | 0.8 |
| | | | | | 1.5 462.7 | |
| | | | SW | | Sand, dark brown, (7.5YR 3/2), moist, loose, medium to coarse grained sand, subangular, trace gravel inclusions up to 0.5", trace silt. | 0.3 |
| 2.5 | | | | | | |
| | | | | | 4.0 460.2 | |
| | | | SM | | Silty Sand, brown (7.5YR 4/3), moist, non-plastic, fine grained sand, subangular, trace clay presence. | 2.8 |
| 5.0 | | | | | 5.0 459.2 | |
| | | | SM | | Silty Sand, brown (7.5YR 5/3), moist to saturated, loose, fine grained sand, subangular, trace clay presence, gravel inclusions up to 0.5". | |
| | | | | | ▽ | |
| 7.5 | | | | | | |
| 10.0 | | | | | 10.0 454.2 | |

Bottom of hole at 10.0 feet.

BHATE ENVIRONMENTAL ASSOCIATES GAFB - SS017.GPJ GINT US LAB.GDT 7/12/17

# APPENDIX B
# LABORATORY DATA PACKAGES
# (PROVIDED ELECTRONICALLY ON CD [SEE SEPARATE FOLDER ON THE CD])

# APPENDIX C
# DATA VALIDATION REPORTS
# (PROVIDED ELECTRONICALLY ON CD)

# Data Validation Report

This report contains the results of the review and validation of the specified data package performed by Marcia Olive, Bhate Environmental Associates, Inc., Denver, Colorado.

## Introduction

This data validation report covers samples taken from Griffiss Air Force Base, New York, on June 1, 2017. Twenty three soil samples, two field duplicates, and associated quality control (QC) blanks were collected from site SS017 (Lot 69 Area of Concern) for site closure activities. All analyses were performed by TestAmerica Laboratories, Inc., Arvada, Colorado. The specific samples included in this validation were:

| Sample Identification | Matrix | Collection Date | Analyses (USEPA Method Number) |
|---|---|---|---|
| SS017-SB09 (0-2) | Soil | 6/1/17 | Volatile Organic Compounds (VOCs, by SW8260B*), Polycyclic Aromatic Hydrocarbons (PAHs, by SW8270D Selective Ion Monitoring [SIM]), Pesticides/ Polychlorinated Biphenyls (PCBs, by SW8081B/8082A), Target Analyte List (TAL) Metals (by SW6010C/7471A) |
| SS017-SB09 (2-4) | | | |
| SS017-SB09 (4-6) | | | |
| SS017-SB10 (0-2) | | | |
| SS017-SB10 (2-4) | | | |
| SS017-SB10 (4-6) | | | |
| SS017-SB10 (0-2)-a | | | |
| SS017-SB10 (2-4)-a | | | |
| SS017-SB01 (0-2) | | | |
| SS017-SB01 (4-6) | | | |
| SS017-SB01 (2-4) | | | |
| SS017-SB01 (6-8) | | | |
| SS017-SS07 | | | |
| SS017-SB07 (0-2) | | | |
| SS017-SB07 (4-6) | | | |
| SS017-SB07 (2-4) | | | |
| SS017-SB08 (0-2) | | | |
| SS017-SB08 (2-4) | | | |
| SS017-SB06 (0-2) | | | |
| SS017-SB06 (2-4) | | | |
| SS017-SB06 (4-6) | | | |
| SS017-SB05 (0-2) | | | |
| SS017-SB05 (2-4) | | | |
| SS017-SB05 (4-6) | | | |
| SS017-SB05 (6-8) | | | |
| Notes: -a = duplicate sample, USEPA = U.S. Environmental Protection Agency<br>*TestAmerica Denver holds both Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) and New York National Environmental Laboratory Accreditation Program (NELAP) certifications for Method 8260B. The reporting limits for all analytes are much lower by 8260B compared to 8260C. | | | |

This data was validated against the laboratory's quality assurance (QA)/quality control (QC) limits using the guidelines and practices published in the *USEPA Contract Laboratory Program National Functional Guidelines* [NFGs] *for Superfund Organic Methods Data Review* (USEPA,

August 2014), *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, August 2014) and per requirements of the DoD Quality Systems Manual (QSM), Version 5.0, as specified in the project-specific Quality Assurance Project Plan (QAPP).

## Sample Handling and Holding Times

The samples were properly preserved and transferred under chain-of-custody to the laboratory for analysis and analyzed within the required holding times.

## Method Blank

4-Isopropyltoluene and/or n-butylbenzene and/or acetone were detected in two volatile method blanks. The compound n-butylbenzene was not detected in the associated samples. 4-Isopropyltoluene was only detected in SS017-SB08 (2-4) at a concentration less that 5x the blank concentration and considered an artifact of blank contamination and flagged "UB". Acetone, when detected in the associated samples, was <10x the blank concentration and was qualified as non-detect, "UB". Multiple metals were detected in the method blanks but all sample concentrations were well above 5x the blank concentration and required no qualification.

## Blank Spike Sample (Laboratory Control Sample)/Surrogates

The laboratory control sample (LCS) recovery of isopropyl ether was above control limits. No samples associated with this batch reported a detection of this compound and no qualification was required.

The volatile surrogate recoveries of 1,2-dichloroethane-d4 and dibromofluoromethane were above control limits for samples SS017-SB09 (0-2) and SS017-SB01 (0-2). No compounds were detected in these samples and no qualification was necessary. Toluene-d8 was recovered below control limits for SS017-SB01 (4-6) due to internal standard failures. All volatile compounds were qualified as estimated, "J/UJ".

The pesticide surrogate, decachlorobiphenyl (DCBP) was recovered above control limits for SS017-SB09 (0-2). The detected compounds were qualified as estimated, "J". DCBP was recovered below control limits for SS017-SB08 (0-2) and SS017-SB08 (2-4). All compounds were qualified as estimated, "J/UJ", in both samples.

DCBP was outside control limits on the primary or secondary columns for samples SS017-SB10 (0-2), SS017-SB10 (2-4), SS017-SB10 (4-6), and SS017-SB07 (4-6). The recoveries were within the NFG's inclusive range of 30% - 150% with the exception of SS017-SB10 (0-2) at 154%. Therefore, no samples required qualification except the aforementioned which required the detected compounds to be flagged as estimated "J".

## Matrix Spike/Matrix Spike Duplicates (MS/MSD)

The MS/MSD recoveries for multiple semi-volatiles were below control limits in parent sample SS017-SB09 (0-2) as well as their relative percent difference (RPD) above control limits. Control limits did not apply to the majority since the sample concentration exceeded the spike concentration by a factor of four or more. The remaining compounds; acenaphthylene,

acenaphthene, anthracene, dibenz(a,h)anthracene, fluorine, and 2-methylnapthlene have been qualified as estimated, “J”, in the parent sample.

The MS/MSD recoveries of Arochlor 1016 were above control limits in sample SS017-SB08 (2-4). Additionally, Arochlor 1260 reported the MSD recovery below control limits. Both RPDs exceeded limits and these compounds were qualified accordingly in the spiked sample (see table below).

For spiked sample SS017-SB09 (0-2), the MS/MSD recoveries for aluminum, antimony, iron, and zinc were outside control limits. Control limits did not apply to iron and aluminum since the sample concentration exceeded the spike concentration by a factor of four or more. Antimony and zinc were qualified as estimated, “J/UJ”, in the parent sample. For spiked sample SS017-SB06 (4-6), the MS/MSD recoveries for antimony, manganese, potassium, iron, and aluminum were outside control limits. Control limits did not apply to iron and aluminum since the sample concentration exceeded the spike concentration by a factor of four or more. Antimony, manganese, and potassium were qualified as estimated, “J/UJ”, in the parent sample.

## Project Specific Quality Assurance/Quality Control

Two field duplicates were collected with this data package. After adjusting for dilution (when necessary), the RPD of multiple compounds were outside control limits for both sets of duplicates. These compounds have been qualified as estimated, “J”, in both sample and duplicate (see table below).

The internal standard, 1,4-Dichlorobenzene-d4, responded below the lower acceptance limit for samples SS017-SB10 (0-2), SS017-SB10 (2-4), SS017-SB10 (0-2)-a, and SS017-SB01 (6-8). Along with 1,4-dichlorobenzene, the internal standards fluorobenzene and chlorobenzene-d5 responded below acceptance limits for sample SS017-SB01 (4-6). The samples were reanalyzed with similar results. The target compounds associated with these standards were qualified as estimated, “J/UJ”.

In batches 376855 and 377237, some continuing calibration blanks reported detections for sodium and potassium. Those associated samples reporting detections <5x the blank concentration were considered artifacts of blank contamination and flagged “UB” (see table below).

## Calibration Verification Data

In batch 376196, the continuing calibration verification (CCV) percent difference (%D) for vinyl acetate, isopropyl ether, and methyl tert-butyl ether were above control limits. These compounds were not detected in the associated samples and required no qualification. The CCV for bromomethane (%D = -20.2%), also in batch 376196, was slightly below control limits. This compound is classified as a poor performer and per NFGs was within the allowable $\pm$30% difference range. Using professional judgment, no qualification was necessary. In batch 277190, the CCV %D for isopropyl ether (-22.0%) was below control limits. This compound was qualified as estimated non-detected, “UJ”, in the associated samples.

## Overall Assessment of Data

All analyses were performed, and the data met the required QC criteria except where noted. The data is 100% complete.

Where a dilution was required, elevated reporting limits are reported.

**Summary of Qualified Results**

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| SS017-SB09 (0-2) | 2-Methylnaphthalene | 41 J | MSD </RPD > |
| | Acenaphthene | 30 J | MS < |
| | Acenaphthylene | 9.4 J | MSD </RPD > |
| | Anthracene | 81 J | MS/MD </RPD > |
| | Dibenz(a,h)anthracene | 57 J | MS/MD </RPD > |
| | Fluorene | 27 J | MS < |
| | 4,4'-DDE | 24 J | Surr > |
| | Gamma-Chlordane | 0.28 J | Surr > |
| | 4,4'-DDT | 44 J | Surr > |
| | Antimony | 1.5 UJ | MS/MSD < |
| | Zinc | 22 J | MSD < |
| SS017-SB10 (0-2) | 1,1,2,2-Tetrachloroethane | 1.9 UJ | IS |
| | 1,2,3-Trichloropropane | 3.8 UJ | IS |
| | Isopropylbenzene | 1.9 UJ | IS |
| | Bromobenzene | 1.9 UJ | IS |
| | n-Propylbenzene | 1.9 UJ | IS |
| | 2-Chlorotoluene | 1.9 UJ | IS |
| | 4-Chlorotoluene | 1.9 UJ | IS |
| | 1,3,5-Trimethylbenzene | 1.9 UJ | IS |
| | tert-Butylbenzene | 1.9 UJ | IS |
| | 1,2,4-Trimethylbenzene | 1.9 UJ | IS |
| | sec-Butylbenzene | 1.9 UJ | IS |
| | 1,2-Dichlorobenzene | 1.9 UJ | IS |
| | 1,3-Dichlorobenzene | 1.9 UJ | IS |
| | 1,4-Dichlorobenzene | 1.9 UJ | IS |
| | 4-Isopropyltoluene | 1.9 UJ | IS |
| | n-Butylbenzene | 1.9 UJ | IS |
| | 1,2-Dibromo-3-Chloropropane | 1.9 UJ | IS |
| | 1,2,4-Trichlorobenzene | 1.9 UJ | IS |
| | Naphthalene | 1.9 UJ | IS |
| | Hexachlorobutadiene | 1.9 UJ | IS |
| | 1,2,3-Trichlorobenzene | 1.9 UJ | IS |
| | Acenaphthene | 360 J | FD RPD |
| | Acenaphthylene | 120 J | FD RPD |
| | Anthracene | 1,100 J | FD RPD |
| | Benzo(a)anthracene | 2,300 J | FD RPD |
| | Benzo(a)pyrene | 1,600 J | FD RPD |
| | Benzo(g,h,i)perylene | 710 J | FD RPD |
| | Benzo(k)fluoranthene | 910 J | FD RPD |
| | Dibez(a,h)anthracene | 290 J | FD RPD |
| | Fluorene | 400 J | FD RPD |
| | Indeno(1,2,3-cd)pyrene | 710 J | FD RPD |
| | Phenanthrene | 3,800 J | FD RPD |
| | 4.4'-DDD | 6.5 J | Surr > |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| | 4.4'-DDE | 3.9 J | Surr > |
| | 4-4'-DDT | 9.1 J | Surr > |
| | Endosulfan sulfate | 0.32 J | Surr > |
| | Gamma-chlordane | 1.8 J | Surr > |
| | Arochlor 1260 | 100 J | FD RPD |
| | Barium | 39 J | FD RPD |
| | Iron | 17,000 J | FD RPD |
| | Sodium | 180 J | FD RPD |
| | Mercury | 40 J | FD RPD |
| SS017-SB10 (0-2)-a | 1,1,2,2-Tetrachloroethane | 1.5 UJ | IS |
| | 1,2,3-Trichloropropane | 2.9 UJ | IS |
| | Isopropylbenzene | 1.5 UJ | IS |
| | Bromobenzene | 1.5 UJ | IS |
| | n-Propylbenzene | 1.5 UJ | IS |
| | 2-Chlorotoluene | 1.5 UJ | IS |
| | 4-Chlorotoluene | 1.5 UJ | IS |
| | 1,3,5-Trimethylbenzene | 1.5 UJ | IS |
| | tert-Butylbenzene | 1.5 UJ | IS |
| | 1,2,4-Trimethylbenzene | 1.5 UJ | IS |
| | sec-Butylbenzene | 1.5 UJ | IS |
| | 1,2-Dichlorobenzene | 1.5 UJ | IS |
| | 1,3-Dichlorobenzene | 1.5 UJ | IS |
| | 1,4-Dichlorobenzene | 1.5 UJ | IS |
| | 4-Isopropyltoluene | 1.5 UJ | IS |
| | n-Butylbenzene | 1.5 UJ | IS |
| | 1,2-Dibromo-3-Chloropropane | 1.5 UJ | IS |
| | 1,2,4-Trichlorobenzene | 1.5 UJ | IS |
| | Naphthalene | 1.5 UJ | IS |
| | Hexachlorobutadiene | 1.5 UJ | IS |
| | 1,2,3-Trichlorobenzene | 1.5 UJ | IS |
| | Acenaphthene | 19 J | FD RPD |
| | Acenaphthylene | 10 J | FD RPD |
| | Anthracene | 54 J | FD RPD |
| | Benzo(a)anthracene | 170 J | FD RPD |
| | Benzo(a)pyrene | 150 J | FD RPD |
| | Benzo(g,h,i)perylene | 86 J | FD RPD |
| | Benzo(k)fluoranthene | 75 J | FD RPD |
| | Dibez(a,h)anthracene | 27 J | FD RPD |
| | Fluorene | 20 J | FD RPD |
| | Indeno(1,2,3-cd)pyrene | 76 J | FD RPD |
| | Phenanthrene | 210 J | FD RPD |
| | Arochlor 1260 | 24 J | FD RPD |
| | Barium | 18 J | FD RPD |
| | Iron | 10,000 J | FD RPD |
| | Sodium | 64 J | FD RPD |
| | Mercury | 16 J | FD RPD |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| SS017-SB10 (2-4) | 1,1,2,2-Tetrachloroethane | 1.5 UJ | IS |
| | 1,2,3-Trichloropropane | 2.9 UJ | IS |
| | Isopropylbenzene | 1.5 UJ | IS |
| | Bromobenzene | 1.5 UJ | IS |
| | n-Propylbenzene | 1.5 UJ | IS |
| | 2-Chlorotoluene | 1.5 UJ | IS |
| | 4-Chlorotoluene | 1.5 UJ | IS |
| | 1,3,5-Trimethylbenzene | 1.5 UJ | IS |
| | tert-Butylbenzene | 1.5 UJ | IS |
| | 1,2,4-Trimethylbenzene | 1.5 UJ | IS |
| | sec-Butylbenzene | 1.5 UJ | IS |
| | 1,2-Dichlorobenzene | 1.5 UJ | IS |
| | 1,3-Dichlorobenzene | 1.5 UJ | IS |
| | 1,4-Dichlorobenzene | 1.5 UJ | IS |
| | 4-Isopropyltoluene | 1.5 UJ | IS |
| | n-Butylbenzene | 1.5 UJ | IS |
| | 1,2-Dibromo-3-Chloropropane | 1.5 UJ | IS |
| | 1,2,4-Trichlorobenzene | 1.5 UJ | IS |
| | Naphthalene | 1.5 UJ | IS |
| | Hexachlorobutadiene | 1.5 UJ | IS |
| | 1,2,3-Trichlorobenzene | 1.5 UJ | IS |
| | 1-Methylnaphthalene | 150 J | FD RPD |
| | 2-Methylnaphthalene | 170 J | FD RPD |
| | Acenaphthene | 4.3 J | FD RPD |
| | Anthracene | 13 J | FD RPD |
| | Benzo(a)anthracene | 23 J | FD RPD |
| | Benzo(a)pyrene | 12 J | FD RPD |
| | Benzo(b)fluoranthene | 23 J | FD RPD |
| | Benzo(g,h,i)perylene | 7.4 J | FD RPD |
| | Benzo(k)fluoranthene | 3.9 J | FD RPD |
| | Chrysene | 67 J | FD RPD |
| | Dibenz(a,h)anthracene | 3.4 J | FD RPD |
| | Fluoranthene | 23 J | FD RPD |
| | Fluorene | 5.7 J | FD RPD |
| | Indeno(1,2,3-cd)pyrene | 4.6 J | FD RPD |
| | Naphthalene | 97 J | FD RPD |
| | Pyrene | 27 J | FD RPD |
| | 4,4'-DDD | 1.6 J | FD RPD |
| | 4,4'-DDT | 0.68 J | FD RPD |
| | Arochlor 1260 | 4.9 J | FD RPD |
| | Aluminum | 3,800 J | FD RPD |
| | Arsenic | 7.2 J | FD RPD |
| | Barium | 21 J | FD RPD |
| | Beryllium | 0.26 J | FD RPD |
| | Calcium | 850 J | FD RPD |
| | Chromium | 4.7 J | FD RPD |
| | Magnesium | 1,200 J | FD RPD |
| | Vanadium | 7.8 J | FD RPD |
| | Zinc | 15 J | FD RPD |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| SS017-SB10 (2-4)-a | 1-Methylnaphthalene | 39 J | FD RPD |
| | 2-Methylnaphthalene | 49 J | FD RPD |
| | Acenaphthene | 11 J | FD RPD |
| | Anthracene | 30 J | FD RPD |
| | Benzo(a)anthracene | 100 J | FD RPD |
| | Benzo(a)pyrene | 89 J | FD RPD |
| | Benzo(b)fluoranthene | 140 J | FD RPD |
| | Benzo(g,h,i)perylene | 52 J | FD RPD |
| | Benzo(k)fluoranthene | 48 J | FD RPD |
| | Chrysene | 130 J | FD RPD |
| | Dibenz(a,h)anthracene | 18 J | FD RPD |
| | Fluoranthene | 190 J | FD RPD |
| | Fluorene | 10 J | FD RPD |
| | Indeno(1,2,3-cd)pyrene | 48 J | FD RPD |
| | Naphthalene | 33 J | FD RPD |
| | Pyrene | 160 J | FD RPD |
| | 4,4'-DDD | 3.8 J | FD RPD |
| | 4,4'-DDT | 4.0 J | FD RPD |
| | Arochlor 1260 | 37 J | FD RPD |
| | Aluminum | 10,000 J | FD RPD |
| | Arsenic | 3.1 J | FD RPD |
| | Barium | 83 J | FD RPD |
| | Beryllium | 0.60 J | FD RPD |
| | Calcium | 1800 J | FD RPD |
| | Chromium | 12 J | FD RPD |
| | Magnesium | 3,100 J | FD RPD |
| | Vanadium | 19 J | FD RPD |
| | Zinc | 37 J | FD RPD |
| SS017-SB01 (4-6) | Methylene chloride | 2.0 J | Surr </IS |
| | Isopropyl ether | 8.8 UJ | Surr </IS/CCV |
| | All non-detect volatiles | UJ | Surr </IS |
| SS017-SB01 (2-4) | Isopropyl ether | 9.8 UJ | CCV |
| SS017-SB01 (6-8) | Isopropyl ether | 7.7 UJ | CCV |
| | Acetone | 88 UB | MB |
| | 1,1,2,2-Tetrachloroethane | 1.5 UJ | IS |
| | 1,2,3-Trichloropropane | 3.1 UJ | IS |
| | Isopropylbenzene | 1.5 UJ | IS |
| | Bromobenzene | 1.5 UJ | IS |
| | n-Propylbenzene | 1.5 UJ | IS |
| | 2-Chlorotoluene | 1.5 UJ | IS |
| | 4-Chlorotoluene | 1.5 UJ | IS |
| | 1,3,5-Trimethylbenzene | 1.5 UJ | IS |
| | tert-Butylbenzene | 1.5 UJ | IS |
| | 1,2,4-Trimethylbenzene | 1.5 UJ | IS |
| | sec-Butylbenzene | 1.5 UJ | IS |
| | 1,2-Dichlorobenzene | 1.5 UJ | IS |
| | 1,3-Dichlorobenzene | 1.5 UJ | IS |
| | 1,4-Dichlorobenzene | 1.5 UJ | IS |
| | 4-Isopropyltoluene | 1.5 UJ | IS |
| | n-Butylbenzene | 1.5 UJ | IS |
| | 1,2-Dibromo-3-Chloropropane | 1.5 UJ | IS |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| | 1,2,4-Trichlorobenzene | 1.5 UJ | IS |
| | Naphthalene | 1.5 UJ | IS |
| | Hexachlorobutadiene | 1.5 UJ | IS |
| | 1,2,3-Trichlorobenzene | 1.5 UJ | IS |
| SS017-SS07 | Isopropyl ether | 8.0 UJ | CCV |
| SS017-SB07 (0-2) | Acetone | 6.4 UB | MB |
| | Isopropyl ether | 6.9 UJ | CCV |
| SS017-SB07 (4-6) | Acetone | 28 UB | MB |
| | Isopropyl ether | 7.5 UJ | CCV |
| SS017-SB07 (2-4) | Acetone | 29 UB | MB |
| | Isopropyl ether | 7.5 UJ | CCV |
| SS017-SB08 (0-2) | Acetone | 48 UB | MB |
| | Isopropyl ether | 6.8 UJ | CCV |
| | 4,4'-DDD | 1.9 UJ | Surr < |
| | 4,4'-DDE | 0.75 UJ | Surr < |
| | 4,4'-DDT | 0.76 J | Surr < |
| | Aldrin | 0.75 UJ | Surr < |
| | alpha-BHC | 0.75 UJ | Surr < |
| | alpha-Chlordane | 1.7 J | Surr < |
| | beta-BHC | 1.9 UJ | Surr < |
| | delta-BHC | 1.1 UJ | Surr < |
| | Dieldrin | 7 J | Surr < |
| | Endosulfan I | 0.75 UJ | Surr < |
| | Endosulfan II | 0.75 UJ | Surr < |
| | Endosulfan sulfate | 0.75 UJ | Surr < |
| | Endrin | 0.75 UJ | Surr < |
| | Endrin aldehyde | 0.75 UJ | Surr < |
| | gamma-BHC | 1.1 UJ | Surr < |
| | gamma-Chlordane | 0.83 J | Surr < |
| | Heptachlor | 0.75 UJ | Surr < |
| | Heptachlor epoxide | 1.1 UJ | Surr < |
| | Methoxychlor | 1.1 UJ | Surr < |
| | Toxaphene | 37 UJ | Surr < |
| SS017-SB08 (2-4) | 4-Isopropyltoluene | 2.5 UB | MB |
| | Acetone | 48 UB | MB |
| | Isopropyl ether | 8.0 UJ | CCV |
| | 4,4'-DDD | 2.0 UJ | Surr < |
| | 4,4'-DDE | 0.82 UJ | Surr < |
| | 4,4'-DDT | 3.2 J | Surr < |
| | Aldrin | 0.82 UJ | Surr < |
| | alpha-BHC | 0.82 UJ | Surr < |
| | alpha-Chlordane | 0.82 UJ | Surr < |
| | beta-BHC | 2.0 UJ | Surr < |
| | delta-BHC | 1.2 UJ | Surr < |
| | Dieldrin | 1.1 J | Surr < |
| | Endosulfan I | 0.82 UJ | Surr < |
| | Endosulfan II | 0.82 UJ | Surr < |
| | Endosulfan sulfate | 0.82 UJ | Surr < |
| | Endrin | 0.82 UJ | Surr < |
| | Endrin aldehyde | 0.82 UJ | Surr < |
| | gamma-BHC | 1.2 UJ | Surr < |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| | gamma-chlordane | 0.82 UJ | Surr < |
| | Heptachlor | 0.82 UJ | Surr < |
| | Heptachlor epoxide | 1.2 UJ | Surr < |
| | Methoxychlor | 1.2 UJ | Surr < |
| | Toxaphene | 40 UJ | Surr < |
| | Arochlor 1016 | 18 UJ | RPD > |
| | Arochlor 1260 | 9.4 UJ | MSD </ RPD > |
| SS017-SB06 (0-2) | Isopropyl ether | 8.7 UJ | CCV |
| SS017-SB06 (2-4) | Isopropyl ether | 8.3 UJ | CCV |
| SS017-SB06 (4-6) | Isopropyl ether | 8.5 UJ | CCV |
| | Antimony | 1.5 UJ | MS/MSD < |
| | Manganese | 180 J | MS > |
| | Potassium | 2,200 UB* | MS/MSD >/CCB |
| | Sodium | 390 UB | CCB |
| SS017-SB05 (0-2) | Isopropyl ether | 9.3 UJ | CCV |
| | Potassium | 930 UB | CCB |
| | Sodium | 580 UB | CCB |
| SS017-SB05 (2-4) | Isopropyl ether | 7.5 UJ | CCV |
| | Potassium | 530 UB | CCB |
| SS017-SB05 (4-6) | Isopropyl ether | 8.6 UJ | CCV |
| | Potassium | 360 UB | CCB |
| | Sodium | 550 UB | CCB |
| SS017-SB05 (6-8) | Isopropyl ether | 8.2 UJ | CCV |
| | Potassium | 1,200 UB | CCB |
| | Sodium | 320 UB | CCB |

Notes: µg/kg = micrograms per kilogram, mg/kg = milligrams per kilogram, MS < = Matrix spike below control limits, MSD < = Matrix Spike duplicate below control limits, RPD > = relative percent difference between MS & MSD is above control limits, surr > = surrogate above control limits, IS = Internal standard outside limits, FD RPD = field duplicate RPD outside control limits, surr < = surrogate below control limits, CCV = continuing calibration blank outside control limits, MB = Method blank contamination, CCB = continuing calibration blank contamination

*the UB qualifier takes precedence over any other applied qualifier

# Data Validation Report

This report contains the results of the review and validation of the specified data package performed by Marcia Olive, Bhate Environmental Associates, Inc., Denver, Colorado.

## Introduction

This data validation report covers samples taken from Griffiss Air Force Base, New York, on June 2, 2017. Seventeen soil samples, two field duplicates, and associated quality control (QC) blanks were collected from site SS017 (Lot 69 Area of Concern) for site closure activities. All analyses were performed by TestAmerica Laboratories, Inc., Arvada, Colorado. The specific samples included in this validation were:

| Sample Identification | Matrix | Collection Date | Analyses (USEPA Method Number) |
|---|---|---|---|
| SS017-SB03 (0-2) | Soil | 6/2/17 | Volatile Organic Compounds (VOCs, by SW8260B*), Polycyclic Aromatic Hydrocarbons (PAHs, by SW8270D Selective Ion Monitoring [SIM]), Pesticides/ Polychlorinated Biphenyls (PCBs, by SW8081B/8082A), Target Analyte List (TAL) Metals (by SW6010C/7471A) |
| SS017-SB03 (2-4) | | | |
| SS017-SB03 (4-6) | | | |
| SS017-SB03 (6-8) | | | |
| SS017-SB03 (2-4)-a | | | |
| SS017-SB03 (4-6)-a | | | |
| SS017-SB04 (0-2) | | | |
| SS017-SB04 (2-4) | | | |
| SS017-SB04 (4-6) | | | |
| SS017-SB04 (6-8) | | | |
| SS017-SB02 (0-2) | | | |
| SS017-SB02 (2-4) | | | |
| SS017-SB02 (4-6) | | | |
| SS017-SB02 (6-8) | | | |
| SS017-SS10 | | | |
| SS017-SS08 | | | |
| SS017-SS06 | | | |
| SS017-SS03 | | | |
| SS017-SS01 | | | |
| Notes: -a = duplicate sample, USEPA = U.S. Environmental Protection Agency<br>*TestAmerica Denver holds both Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) and New York National Environmental Laboratory Accreditation Program (NELAP) certifications for Method 8260B. The reporting limits for all analytes are much lower by 8260B compared to 8260C. | | | |

This data was validated against the laboratory's quality assurance (QA)/quality control (QC) limits using the guidelines and practices published in the *USEPA Contract Laboratory Program National Functional Guidelines* [NFGs] *for Superfund Organic Methods Data Review* (USEPA, August 2014), *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, August 2014) and per requirements of the DoD Quality Systems Manual (QSM), Version 5.0, as specified in the project-specific Quality Assurance Project Plan (QAPP).

## Sample Handling and Holding Times

The samples were properly preserved and transferred under chain-of-custody to the laboratory for analysis and analyzed within the required holding times. One of the three soil jars for sample SS017-SB04 (6-8) was received broken. The sample volume remaining was sufficient to proceed with the analyses.

## Method Blank

Acetone and/or 4-isopropyltoluene were detected in two method blanks. Isopropyltoluene was not detected in the associated samples and required no qualification. Acetone was only detected in associated sample SS017-SB03 (6-8) and was qualified as non-detect, "UB", due to blank contamination. Calcium, chromium, nickel, and magnesium were detected in method blank 376127/1-A. All these compounds were >5x the blank concentration, in the associated samples, and required no qualification.

## Blank Spike Sample (Laboratory Control Sample)/Surrogates

The volatile surrogate recovery of toluene-d8 was below control limits in sample SS017-SS06 while the recovery of dibromofluoromethane was above control limits. The compounds were qualified estimated non-detected "UJ".

The semi-volatile surrogates were diluted out of sample SS017-SB03 (0-2). The surrogate terphenyl-d14 was recovered above control limits for the matrix spike and duplicate samples which used this sample as the parent sample. Considering this surrogate is associated with all the reported semi-volatile compounds; the data was qualified as estimated, "J".

The pesticide surrogates were diluted out of sample SS017-SB03 (0-2). The blank and spike surrogates were within control limits. Therefore, no qualification of the data was deemed necessary. Decachlorobiphenyl (DCBP) was recovered above control limits for the dilution analysis of samples SS017-SB03 (2-4), SS017-SB03 (2-4)-a, SS017-SB04 (0-2), SS017-SB02 (0-2), SS017-SS10, SS017-SS06, and SS017-SS03. Only sample SS017-SB04 (0-2) reported detections for DDE and DDT from the dilution and were qualified as estimated, "J". DCBP was recovered (62.12%) below control limits on the primary column for sample SS017-SB02 (6-8). The recovery was within the NFGs inclusive range of 30% - 150% and therefore required no qualification. DCBP was recovered below control limits for the PCB analysis of SS017-SB04 (6-8), SS017-SS06, and SS017-SS03. The compounds were qualified as estimated, "J/UJ".

## Matrix Spike/Matrix Spike Duplicates (MS/MSD)

The MS/MSD recoveries and relative percent difference (RPD) for all semi-volatiles were outside control limits in parent sample SS017-SB03 (0-2) used for the matrix spike. Control limits did not apply since the sample concentration exceeded the spike concentration by a factor of four or more. Therefore, no qualification was deemed necessary.

The MS and MSD recoveries of Arochlor 1016 were above control limits. This compound was not detected in the parent sample, SS017-SB03 (6-8), and required no qualification.

The MS/MSD recoveries and/or RPDs for several metals were outside control limits. Control limits did not apply to iron, manganese, calcium, and aluminum since the sample concentration exceeded the spike concentration by a factor of four or more. The remaining metals were qualified as estimated, "J/UJ", in the parent sample SS017-SB03 (0-2).

## Project Specific Quality Assurance/Quality Control

The RPD between the two parent samples and duplicates was outside control limits for multiple compounds. These compounds have been qualified as estimated, "J", in the four samples (see table below).

Acetone was reported in the trip blank. When detected in the samples at a concentration of <10x the blank result, this analyte was qualified as non-detected and flagged, "UB", at the reported value.

The internal standards, 1,4-dichlorobenzene-d4, fluorobenzene, and chlorobenzene-d5 responded below the lower acceptance limit for sample SS017-SS06. The sample was reanalyzed with similar results. All compounds were qualified as estimated, non-detected, "UJ".

The serial dilution of sample SS017-SB03 (0-2) resulted in the %D of aluminum, calcium, iron, magnesium, and manganese >10. These compound results were >50x the detection limits and were qualified as estimated, "J".

## Calibration Verification Data

In batch 377219, the continuing calibration verification (CCV) for isopropyl ether (-22.0%) was below control limits. In batch 377520, the CCV for bromomethane (-21.3%) was below control limits. Bromomethane is classified as a poor performer and per NFGs was within the allowable ±30% difference range and did not require qualification. Isopropyl ether was qualified as estimated, non-detected, "UJ", in the associated samples. Additionally, the closing CCV for sample SS017-SS01 was not analyzed due to an instrument malfunction. The instrument did perform within DoD Version 5.0 criteria once restarted on the same tune parameters the next day.

The CCV for 4,4'-DDT and methoxychlor were below control limits in batch 378547 along with the DCBP surrogate. These compounds were reported from the dilution analysis of which this batch did not include. Therefore, no qualification of the data was required.

## Overall Assessment of Data

All analyses were performed, and the data met the required QC criteria except where noted. The data is 100% complete.

Where a dilution was required, elevated reporting limits are reported.

**Summary of Qualified Results**

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| SS017-SB03 (0-2) | Isopropyl ether<br>1-Methylnaphthalene | 7.0 UJ<br>430 J | CCV<br>Surr > |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| | 2-Methylnaphthalene | 520 J | Surr > |
| | Acenaphthene | 3,200 J | Surr > |
| | Acenaphthylene | 270 J | Surr > |
| | Anthracene | 7,200 J | Surr > |
| | Benzo(a)anthracene | 19,000 J | Surr > |
| | Benzo(a)pyrene | 17,000 J | Surr > |
| | Benzo(b)fluoranthene | 23,000 J | Surr > |
| | Benzo(g,h,i)perylene | 9,000 J | Surr > |
| | Benzo(k)fluoranthene | 7,700 J | Surr > |
| | Chrysene | 23,000 J | Surr > |
| | Dibenz(a,h)anthracene | 3,000 J | Surr > |
| | Fluoranthene | 42,000 J | Surr > |
| | Fluorene | 3,000 J | Surr > |
| | Indeno(1,2,3-cd)pyrene | 8,400 J | Surr > |
| | Naphthalene | 970 J | Surr > |
| | Phenanthrene | 30,000 J | Surr > |
| | Pyrene | 34,000 J | Surr > |
| | Aluminum | 6,700 J | SD |
| | Antimony | 1.3 UJ | MS/MSD </RPD > |
| | Arsenic | 3.9 J | MS </RPD > |
| | Barium | 30 J | RPD > |
| | Beryllium | 0.27 J | MS </RPD > |
| | Cadmium | 0.072 J | MS </RPD > |
| | Calcium | 29,000 J | SD |
| | Cobalt | 4.7 J | MS/MSD </RPD > |
| | Copper | 24 J | MS/MSD < |
| | Iron | 14,000 J | SD |
| | Magnesium | 3,700 J | MS </RPD >/SD |
| | Manganese | 560 J | SD |
| | Nickel | 10 J | MS </RPD > |
| | Selenium | 2.5 UJ | RPD > |
| | Silver | 0.51 UJ | RPD > |
| | Sodium | 300 J | RPD > |
| | Potassium | 840 J | MSD >/RPD> |
| | Thallium | 2.1 UJ | MS </RPD > |
| | Zinc | 43 J | MS/MSD < |
| SS017-SB03 (2-4) | Isopropyl ether | 6.5 UJ | CCV |
| | 1-Methylnaphthalene | 10 J | FD RPD |
| | 2-Methylnaphthalene | 12 J | FD RPD |
| | Fluorene | 52 J | FD RPD |
| | Naphthalene | 17 J | FD RPD |
| | Aluminum | 3,000 J | FD RPD |
| | Arsenic | 1.8 J | FD RPD |
| | Barium | 12 J | FD RPD |
| | Beryllium | 0.13 J | FD RPD |
| | Calcium | 1,400 J | FD RPD |
| | Chromium | 3.3 J | FD RPD |
| | Cobalt | 2.1 J | FD RPD |
| | Copper | 7.3 J | FD RPD |
| | Iron | 6,600 J | FD RPD |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| | Lead | 1.8 J | FD RPD |
| | Magnesium | 1,200 J | FD RPD |
| | Manganese | 230 J | FD RPD |
| | Nickel | 4.8 J | FD RPD |
| | Sodium | 140 J | FD RPD |
| | Vanadium | 5.4 J | FD RPD |
| | Zinc | 14 J | FD RPD |
| SS017-SB03 (2-4)-a | Isopropyl ether | 7.6 UJ | CCV |
| | 1-Methylnaphthalene | 20 J | FD RPD |
| | 2-Methylnaphthalene | 27 J | FD RPD |
| | Fluorene | 95 J | FD RPD |
| | Naphthalene | 45 J | FD RPD |
| | Aluminum | 9,100 J | FD RPD |
| | Arsenic | 3.2 J | FD RPD |
| | Barium | 41 J | FD RPD |
| | Beryllium | 0.36 J | FD RPD |
| | Calcium | 3,500 J | FD RPD |
| | Chromium | 14 J | FD RPD |
| | Cobalt | 4.7 J | FD RPD |
| | Copper | 14 J | FD RPD |
| | Iron | 17,000 J | FD RPD |
| | Lead | 6.5 J | FD RPD |
| | Magnesium | 2,100 J | FD RPD |
| | Manganese | 640 J | FD RPD |
| | Nickel | 10 J | FD RPD |
| | Sodium | 340 J | FD RPD |
| | Vanadium | 15 J | FD RPD |
| | Zinc | 43 J | FD RPD |
| SS017-SB03 (4-6) | Isopropyl ether | 7.5 UJ | CCV |
| | Acenaphthene | 1.8 J | FD RPD |
| | Anthracene | 4.4 J | FD RPD |
| | Benzo(a)anthracene | 13 J | FD RPD |
| | Benzo(a)pyrene | 11 J | FD RPD |
| | Benzo(b)fluoranthene | 16 J | FD RPD |
| | Benzo(g,h,i)perylene | 6.7 J | FD RPD |
| | Benzo(k)fluoranthene | 6.0 J | FD RPD |
| | Chrysene | 14 J | FD RPD |
| | Fluoranthene | 26 J | FD RPD |
| | Fluorene | 1.6 J | FD RPD |
| | Indeno(1,2,3-cd)pyrene | 6.3 J | FD RPD |
| | Phenanthrene | 16 J | FD RPD |
| | Pyrene | 22 J | FD RPD |
| | Aluminum | 2,900 J | FD RPD |
| | Chromium | 3.1 J | FD RPD |
| SS017-SB03 (4-6)-a | Isopropyl ether | 7.6 UJ | CCV |
| | Acenaphthene | 0.82 J | FD RPD |
| | Anthracene | 1.8 J | FD RPD |
| | Benzo(a)anthracene | 3.9 J | FD RPD |
| | Benzo(a)pyrene | 3.5 J | FD RPD |
| | Benzo(b)fluoranthene | 4.9 J | FD RPD |

| Sample Identification | Compound | Qualifier (µg/kg) Metals (mg/kg) | Reason Code |
|---|---|---|---|
| | Benzo(g,h,i)perylene | 2.0 J | FD RPD |
| | Benzo(k)fluoranthene | 1.7 J | FD RPD |
| | Chrysene | 4.5 J | FD RPD |
| | Fluoranthene | 7.8 J | FD RPD |
| | Fluorene | 0.73 J | FD RPD |
| | Indeno(1,2,3-cd)pyrene | 1.9 J | FD RPD |
| | Phenanthrene | 6.2 J | FD RPD |
| | Pyrene | 6.5 J | FD RPD |
| | Aluminum | 4,900 J | FD RPD |
| | Chromium | 5.3 J | FD RPD |
| SS017-SB03 (6-8) | Acetone | 54 UB | TB/MB |
| | Isopropyl ether | 6.9 UJ | CCV |
| SS017-SB04 (0-2) | Isopropyl ether | 8.3 UJ | CCV |
| | 4,4'-DDE | 41 J | Surr > |
| | 4,4'-DDT | 120 J | Surr > |
| SS017-SB04 (4-6) | Acetone | 5.7 UB | TB |
| SS017-SB04 (6-8) | Arochlor 1016 | 24 UJ | Surr < |
| | Arochlor 1221 | 27 UJ | Surr < |
| | Arochlor 1232 | 24 UJ | Surr < |
| | Arochlor 1242 | 52 UJ | Surr < |
| | Arochlor 1248 | 32 UJ | Surr < |
| | Arochlor 1254 | 27 UJ | Surr < |
| | Arochlor 1260 | 12 UJ | Surr < |
| SS017-SB02 (0-2) | Acetone | 6.8 UB | TB |
| SS017-SB02 (2-4) | Acetone | 26 UB | TB |
| SS017-SB02 (4-6) | Acetone | 8.8 UB | TB |
| SS017-SB02 (6-8) | Acetone | 27 UB | TB |
| SS017-SS08 | Acetone | 10 UB | TB |
| SS017-SS06 | All non-detect VOCs | UJ | Surr </IS |
| | Arochlor 1016 | 17 UJ | Surr < |
| | Arochlor 1221 | 20 UJ | Surr < |
| | Arochlor 1232 | 17 UJ | Surr < |
| | Arochlor 1242 | 38 UJ | Surr < |
| | Arochlor 1248 | 23 UJ | Surr < |
| | Arochlor 1254 | 20 UJ | Surr < |
| | Arochlor 1260 | 14 J | Surr < |
| SS017-SS03 | Arochlor 1016 | 16 UJ | Surr < |
| | Arochlor 1221 | 18 UJ | Surr < |
| | Arochlor 1232 | 16 UJ | Surr < |
| | Arochlor 1242 | 35 UJ | Surr < |
| | Arochlor 1248 | 21 UJ | Surr < |
| | Arochlor 1254 | 18 UJ | Surr < |
| | Arochlor 1260 | 89 J | Surr < |

Notes: µg/kg = micrograms per kilogram, mg/kg = milligrams per kilogram, MS/MSD (<) (>) = Matrix spike and matrix spike duplicate (below) (above) control limits, RPD > = MS/MSD relative percent difference above control limits, surr > = surrogate above control limits, FD RPD = field duplicate RPD outside control limits, surr < = surrogate below control limits, CCV = continuing calibration blank outside control limits, TB = Trip blank contamination, SD = serial dilution

# ATTACHMENT 1
# BASELINE HUMAN HEALTH RISK ASSESSMENT

# BASELINE HUMAN HEALTH RISK ASSESSMENT
# LOT 69 HAZARDOUS WASTE STORAGE AREA (SS017)
# FORMER GRIFFISS AIR FORCE BASE
# ROME, NEW YORK

**January 2020**

Prepared for:

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| % | Percent |
| AAF | Absorption adjustment factors |
| ADAF | Age Dependent Adjustment Factor |
| AFB | Air Force Base |
| ASL | Above Screening Level |
| AT | Averaging time |
| ATSDR | Agency for Toxicity Substances and Disease Registry |
| Bhate | Bhate Environmental Associates, Inc. |
| BSL | Below Screening Level |
| cc | Cubic centimeter |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| cm | Centimeters |
| $cm^2/s$ | Square centimeters per second |
| COCs | Chemicals of concern |
| COPCs | Chemicals of potential concern |
| CSF | Cancer slope factor |
| CSM | Conceptual Site Model |
| CTE | Central Tendency Exposure |
| DAF | Dermal absorption fraction |
| EN | Essential Nutrient |
| EPCs | Exposure point concentrations |
| ft bgs | Feet below ground surface |
| FPM | FPM Remediations, Inc. or FPM Group, Ltd. |
| $g/cm^3$ | Grams per cubic centimeter |
| g-C/g-soil | Grams carbon per grams soil |
| g/day | Grams per day |
| $g/m^2$-hr | Grams per square meter-hour |
| $g/m^2$-s | Grams per square meter-second |
| GI | Gastrointestinal |
| GIAB | Gastrointestinal Absorption Factor |
| HHRA | Human Health Risk Assessment |
| HI | Hazard Index |
| HQ | Hazard Quotient |
| ICs | Institutional Controls |

| | |
|---|---|
| IRIS | Integrated Risk Information System |
| IUR | Inhalation unit risk |
| kg | Kilograms |
| kg/g | Kilograms per gram |
| $kg/m^3$ | Kilograms per cubic meter |
| $kg\text{-}soil/m^3\text{-}air$ | Kilograms of soil per cubic meter of air |
| KHC | Known Human Carcinogen |
| L/kg | Liters per kilogram |
| LOAEL | Lowest-observed-adverse-effect-level |
| LRA | Local Reuse Agency |
| LUCs | Land Use Controls |
| $m^2$ | Square meter |
| m/s | Meters per second |
| $m^3/kg$ | Cubic meters per kilogram |
| $mg/cm^2$ | Milligrams per square centimeter |
| mg/day | Milligrams per day |
| mg/kg | Milligrams per kilogram |
| mg/kg-day | Milligrams per kilogram body weight per day |
| $mg/m^3$ | Milligrams per cubic meter |
| $\mu g/m^3$ | Micrograms per cubic meter |
| MMOA | Mutagenic mode of action |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| ND | Non-detect |
| NOAA | National Oceanic Atmospheric Administration |
| NOAEL | No-observed-adverse-effect-level |
| NSL | No Screening Level |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| OSWER | Office of Solid Waste and Emergency Response |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCBs | Polychlorinated biphenyls |
| PEF | Particulate Emission Factor |
| PM | Particulate Matter |
| PPRTVs | Provisional Peer Reviewed Toxicity Values |
| RAGS | Risk Assessment Guidance for Superfund |
| RfC | Reference concentration |
| RfD | Reference dose (oral) |

| | |
|---|---|
| RI | Remedial Investigation |
| RME | Reasonable Maximum Exposure |
| ROD | Record of Decision |
| RPF | Relative Potency Factor |
| RSL | Regional Screening Level |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| SVOCs | Semi-Volatile Organic Compounds |
| TAL | Target Analyte List |
| UCL | Upper Confidence Limit |
| UFP-QAPP | Uniform Federal Policy-Quality Assurance Project Plan |
| USEPA | United States Environmental Protection Agency |
| VF | Volatilization Factor |
| VOCs | Volatile Organic Compounds |
| WOE | Weight of Evidence |

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# EXECUTIVE SUMMARY

This Baseline Human Health Risk Assessment (HHRA) for the Former Griffiss Air Force Base (AFB) evaluates Site SS017 (the "Site"), Lot 69 Hazardous Waste Storage Area, located in Rome, New York. This Baseline HHRA evaluated cancer risks and non-cancer health hazards from exposure to Site soils in the absence of the current Land Use Controls (LUCs). The LUCs maintain land use as non-residential, consistent with the Site's Record of Decision (ROD). The LUC prevents development of the Site for residential land use.

The goal of the Baseline HHRA is to evaluate the cancer risks and non-cancer hazards to the Reasonably Maximally Exposed Individual. The Reasonable Maximum Exposure (RME) is defined as the highest exposure that is reasonably expected to occur at a site, in the absence of current LUCs/Institutional Controls (ICs). RMEs are estimated for individual pathways (United States Environmental Protection Agency [USEPA], December 1989 – Risk Assessment Guidance for Superfund [RAGS] Part A). The Baseline HHRA evaluates future exposures under an assumption of residential land use. The receptors include: a future resident (adult and child) and an adult construction worker. The future adult resident receptor was not evaluated because the young child is the most sensitive receptor. The assessment assumes the future receptors may be exposed to soils at depths of 0 to 2 feet below ground surface (ft bgs) and 0 ft bgs to the Water Table. The exposures include direct contact with the soil at both depths, in the event the soil is brought to the surface and not managed.

The risk assessment results for each receptor are summarized in the Table below and the following text organized by receptor.

| | **Cancer Risks** | | **Non-cancer Hazard** | |
|---|---|---|---|---|
| | **Soil Depth** | | **Soil Depth** | |
| | **0 to 2 ft bgs** | **0 ft bgs to Water Table** | **0 to 2 ft bgs** | **0 ft bgs to Water Table** |
| Receptors | | | | |
| Future Resident | | | | |
| Adult/Child (combined) * | 1.8E-04 | 7.5E-05 | | |
| Young Child | | | 1.8 | 1.2 |
| Adult | | | 0.2 | 0.13 |
| Future Construction Worker (Adult) | 1.6E-07 | 7.2E-08 | 0.2 | 0.2 |
| *Non-cancer hazards were not calculated since the young child is the most sensitive receptor. | | | | |

In general, the concentrations of Chemicals of Potential Concern (COPCs) are comparable at both depths for both receptors. Evaluation of the data indicates minor differences in chemical concentrations based on depths. These slight differences result in slight differences in calculated cancer risks and non-cancer hazards.

**Future Resident.** The cancer risks to the future adult/child resident are within the upper bounds of the risk range established under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) of 1 x 10-6 (one in a million) to 1 x 10-4 (one in ten thousand) (USEPA 1990, December 1991b). The main chemical contributing to this risk based on a depth of 0 ft bgs to 2 ft bgs is benzo(a)pyrene with a total risk for the future resident across all pathways of 1 x 10-4 or one in ten thousand. Other contributors with risks greater than 1 x 10-5 were: benzene; benzo(b)fluoranthene; chromium (VI); and dibenzo(a,h)anthracene. Uncertainty associated with exposure to chromium VI is the assumption that in the absence of speciated data, the chemical is present as only chromium VI, which is a potential overestimate of the cancer risks.

The non-cancer hazards for the future resident child exceeded the goal of protection of a Hazard Index (HI) = 1 with a total non-cancer HI = 1.8. Further evaluation of the non-cancer hazards based on target organ indicates the HI did not exceed 1 for the chemicals impacting the same target organ (USEPA, August 2000). The adult non-cancer hazard met the goal of protection.

The cancer risks from future residential exposures to soils at depths of 0 ft bgs to the Water Table were 7.5 x 10-5 and is within the risk range established under the NCP. The non-cancer HI was 1.2 but the evaluation of hazards from exposures based on target organ indicates the target organ hazards are below the goal of protection of an HI = 1 (USEPA, August 2000).

**Future Construction Worker**. All cancer risks from exposure to the future construction worker at both soil depths are below the risk range established under the NCP of 1 x 10-6 (one in a million) to 1 x 10-4 (one in ten thousand). The cancer risks from exposure to the surface soils (0 to 2 ft bgs) were 1.6 x 10-7 which is below the risk range and exposures to soils from 0 ft bgs to the Water Table are 7.1 x 10-8.

The non-cancer hazard is evaluated based on the goal of protection of an HI equal or less than 1 e.g., HI = 1. The HI for the construction worker exposed to soils at depths of 0 ft bgs to 2 ft bgs and from 0 ft bgs to the Water Table were 0.2 which is below the goal of protection of an HI = 1.

**Central Tendency Exposures to a Future Resident Exposed to Soils at 0 to 2 ft bgs**. Consistent with the Risk Characterization Handbook and Policy (USEPA, December 2000), based on the results of the risk assessment for the future resident, cancer risks and non-cancer hazards were calculated for the Central Tendency Exposure (CTE) or average exposure to evaluate the significance of the main risk drivers. Appendix F includes the RAGS Part D Tables 4.1 through 4.3 with exposure assumptions for the average exposure duration. The exposure duration was obtained from the Exposure Factors Handbook, Chapter 16, Activity Factors (USEPA, September 2011 [and updates]). Consistent with the updated Exposure Factors Handbook, the same study was used to identify the average length of time an individual will remain at a residence. Page 16-2 of the document indicates: "The mean and 90th percentile for residential occupancy period from Johnson and Capel (1992) are 12 years and 26 years, respectively". A total of 12 years was used for the 50th percentile with 6 years for a child and 6 years for an adult. The exposure duration is the only input parameter changed when determining the CTE. Subchronic toxicity values were not used in this assessment since the individual would be exposed for a chronic

period of time (e.g., greater than 7 years). Mutagenic chemicals are included in the CTE as a sum across the age range to provide a total cancer risk.

The CTE risk calculations provide information on the CTE or average exposures; however, decisions are based on the Reasonably Maximally Exposed Individual. The resulting cancer risks were 1.6 x 10-4 and the non-cancer hazards were a HI = 1.8, however, the hazards based on Target Organ are below a HI = 1.

The calculated CTE risks indicate that the main contributors to the cancer risks were benzo(a)pyrene (9.5 x 10-5) and chromium VI (2.6 x 10-5). The RME cancer risks from exposure to chromium are based on the VI valence state based on a lack of speciated data that may result in an overestimate of the cancer risks.

**Conclusions.** The results of the risk assessment indicate that the risks to the future resident are within the upper bounds of the risk range (USEPA, December 1991b). The non-cancer hazards based on the Target Organ were below the goal of protection of an HI = 1.

The cancer risks to the future construction worker were below the goal of protection of 1 x 10-6 or one in a million. The non-cancer HI was also below the goal of protection of a HI = 1.

The results of the cancer assessment for the future resident exposed to soils at depths of 0 to 2 ft bgs indicates the need for further evaluation of benzo(a)pyrene with respect to risk management. A discussion regarding Polycyclic Aromatic Hydrocarbon (PAH) impacts (e.g., benzo(a)pyrene) from the asphalt paved parking lot that covers approximately 70 percent (%) of the Site SS017 footprint is provided in Section 5.4.1 (Risk Management for PAH Impacts) of the *Supplemental Site Inspection Report Lot 69 Hazardous Waste Storage Area (SS017) Former Griffiss Air Force Base Rome, New York* (Bhate Environmental Associates, Inc. [Bhate], August 2019).

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# 1 INTRODUCTION

This document provides the Baseline Human Health Risk Assessment (HHRA) for the Former Griffiss Air Force Base (AFB) Site 17 (SS017, Lot 69 Hazardous Waste Storage Area), located in Rome, New York (the "Site"). The Baseline HHRA is being conducted under the authority of the United States Environmental Protection Agency (USEPA), pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990); and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The Baseline HHRA is required to support Site decisions under Superfund law regarding the removal of Land Use Controls (LUCs).

The Baseline HHRA is a baseline evaluation assuming no Institutional Controls (ICs), such as the current LUCs to prevent use of the Site for residential use, and no remedial actions at the Site. The Baseline HHRA evaluated future exposures to Site soils at depths of 0 to 2 feet below ground surface (ft bgs) and 0 ft bgs to the Water Table. The assessment quantified potential health risks from exposure to chemicals found in soil samples collected in 2017 at both depths including Target Analyte List (TAL) metals, Polycyclic Aromatic Hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs) evaluated as commercial Aroclor mixtures (e.g., Aroclor 1260), and Volatile Organic Compounds (VOCs).

The Baseline HHRA evaluated exposures to the Reasonably Maximally Exposed Individual under both current and future conditions. The Reasonable Maximum Exposure (RME) is defined as the highest exposure that is reasonably expected to occur at a site. RMEs are estimated for individual pathways (USEPA, December 1989 – Risk Assessment Guidance for Superfund [RAGS] Part A) and provide the basis for decisions under CERCLA, including the decision regarding removing the current LUCs to allow future residential development of the property.

## 1.1 Baseline Human Health Risk Assessment

The Baseline HHRA follows the four steps of the risk assessment process listed below:

- Hazard Identification – identifies contaminants at the Site that can pose a risk to human health under current and future land use conditions. This step, including data collection and analysis, involves gathering data to define the nature and extent of contamination and using the sample data to select chemicals of potential concern (COPCs). The COPCs are evaluated in the remaining steps of the Baseline HHRA listed in the bullets below.
- Exposure Assessment – identifies possible exposure pathways such as ingestion of soil, inhalation of particulates, or dermal contact with soil. The exposure assessment includes an estimation of human chemical intake, or dose, for each receptor based on default Superfund exposure assumptions representing residential and construction worker receptors (USEPA, February 2014).
- Dose Response – evaluates the chemical toxicity of each COPC including the evaluation of cancer and non-cancer toxicity for each COPC.

- Risk Characterization – describes the likelihood and degree of chemical exposure and the possible adverse health effects associated with the exposure(s) including a discussion of the uncertainties.

The Baseline HHRA was performed in accordance with guidance, policies, and guidelines provided by the USEPA, including but not limited to:

- *Risk Assessment Guidance for Superfund* - Parts A, B, D, E, and F (USEPA, December 1989, December 1991a, December 2001, July 2004, and January 2009, respectively).
- *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions* (USEPA, April 1991).
- *Guidance for Data Useability in Risk Assessment* (Parts A and B) (USEPA, December 1991b and May 1992a).
- *Guidelines for Exposure Assessment* (USEPA, May 1992b).
- *Land Use in the CERCLA Remedy Selection Process* (USEPA, May 1995).
- *EPA Risk Characterization Program* (USEPA, March 1995).
- *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, December 2002a).
- *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA, December 2002b).
- *Human Health Toxicity Values in Superfund Risk Assessments* (USEPA, December 2003).
- *Guidelines for Carcinogen Risk Assessment* (USEPA, March 2005a).
- *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (USEPA, March 2005b).
- *Exposure Factors Handbook: 2011 Edition* (USEPA, September 2011).
- *Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil* (USEPA, December 2012).
- *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (USEPA, February 2014).
- *ProUCL Version 5.1 Technical Guide Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations* (USEPA, October 2015).
- Regional Screening Levels (USEPA, April2019).

## 1.2 Site Overview and Historical Perspective

The following site information was obtained from the *2015 Third Five-Year Review Former Griffiss Air Force Base* (FPM Remediations, Inc. [FPM]/Cape, June 2015). The information was obtained from the webpage link: https://semspub.epa.gov/work/02/350524.pdf. Site SS017 (Lot 69) is

located in the south central industrialized part of Griffiss AFB, east of the Building 20 site and bordered on the south side by Ellsworth Road (Figures 1 and 2 in Appendix A).

### 1.2.1 History

Site SS017 (Lot 69) is located along the north side of Ellsworth Road (Parcels F1 and F6B-4), which is currently used as a parking lot for school buses. Figure 9 of the Third Five Year Review illustrates the Site SS017 (Lot 69) location and deed restrictions, as well as the LUCs/ICs as required by the ROD. From 1965 to 1982, Lot 69 was an unfenced interim storage area for containers of liquid and solid hazardous wastes generated at Griffiss AFB. A review of aerial photographs indicates the location of Building 11 was the original storage area. Wastes managed at the site included soot from No. 6 fuel oil, flammable liquids, spent corrosives, trap grease, spent solvents, neutralized acids, spent paint thinners, fuel spill residues, and waste oils. The drums were stored outside on raised pallets, and the storage area was diked. During the period of use, spills were reported to have occurred. Therefore, the original source for purposes of the HHRA is the Building 11 footprint. However, unbiased samples were collected throughout the site for preparation and evaluation via this baseline HHRA. Locations and depth intervals of samples collected were based upon scoping discussions with the USEPA, New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), and Air Force as documented in Worksheet 9 of the Uniform Federal Policy- Quality Assurance Project Plan (UFP-QAPP) (Bhate, February 2017) and are considered representative of the site.

#### 1.2.1.1 Previous Investigations

This section provides a summary of the pre-ROD activities conducted at the site. All sampling locations discussed in this section are illustrated in figures provided in the documents referenced below.

The Remedial Investigation (RI) was conducted in 1994 which included soil sampling, groundwater sampling, and a baseline risk assessment (Law Engineering and Environmental Services, Inc., December 1996). A soil investigation was conducted in which soil samples were collected from 13 borings and analyzed for VOCs, Semi-Volatile Organic Compounds (SVOCs), pesticides, PCBs, and metals. Soil sample results showed 5 VOCs, 21 SVOCs, 31 pesticides/PCBs, and 24 metals (Law Engineering and Environmental Services, Inc., December 1996). Soil exceedances of applicable RI criteria were limited to 4 SVOCs, 1 pesticide/PCB, and 8 metals. During the 1994 SS017 RI, the eight soil borings were advanced through the asphalt parking lot to groundwater. The SS017 RI Report (Law Engineering and Environmental Services, Inc., December 1996) attributed the asphalt pavement as the source of the PAHs detected in the shallow soil sample intervals (0-2 ft bgs). Four groundwater monitoring wells (L69MW2-1, L69MW-1, -3, and -4) and one bedrock well (L69MW2-2) were installed in June and July 1994. August 1994 groundwater samples showed no exceedances for either VOCs or SVOCs. Metals and one pesticide exceedances were reported.

As part of the RI, a baseline risk assessment was performed to evaluate the current and future (industrial use) potential risks to human health and the environment associated with chemicals of concern (COCs) found in the soils and groundwater at the site. The total carcinogenic risk associated with exposure by industrial, utility, and construction workers to contaminants in the soil or groundwater were within the lower end of the acceptable USEPA risk range of 1 x 10-6 to 1 x 10-4 (one in a million to one in ten thousand). The Hazard Index (HI) was below the acceptable level of 1 for utility and construction workers. However, the HI was above the benchmark level of 1 for the industrial exposure scenario. An ecological risk assessment was also performed at the site. The assessment identified that there were no complete exposure pathways for ecological receptors.

A 1997 Supplemental Investigation included groundwater sampling in the storm drain area yielding detections of chlorinated VOCs below NYSDEC Groundwater Standards (Ecology and Environment, Inc., July 1998).

### 1.2.1.2 ROD Requirements

The ROD for Site SS017 (Lot 69) (Air Force Base Conversion Agency, December 2004) was signed by the USEPA in March 2005. Based on the previous investigations and environmental conditions at the site, the selected remedy for Site SS017 (Lot 69) is LUCs/ICs for non-residential use and groundwater use restrictions. The ROD for Site SS017 states that:

- Development and use of the entire Lot 69 property for residential housing, elementary and secondary schools, childcare facilities, and playgrounds will be prohibited unless prior approval is received from the Air Force, USEPA, and NYSDEC; and

- The owner or occupant of this site shall not extract, utilize, consume, or permit to be extracted, any water from the subsurface aquifer within the boundary of the site unless such owner or occupant obtains prior written approval from the NYSDOH.

### 1.2.1.3 Land-Reuse Zoning

The land-reuse zoning for the former Griffiss AFB is illustrated on Figure 2. The Griffiss Local Reuse Agency (LRA) designated Parcels F1 and F6B-4, which contain Site SS017 (Lot 69), for industrial (light industrial development) use. The City of Rome adopted the LRA's zoning designation in 1998.

### 1.2.1.4 Post-ROD Activities

Following the RI, the Air Force performed annual groundwater sampling in March 2002, March 2003, and March 2004 for total and dissolved metals and results showed only total metal exceedances at all of the monitoring wells. The metals exceedances were similar to elevated metals concentrations detected throughout the base during the RI. Additionally, suspended solids were observed in the samples. Therefore, the elevated metal concentrations were attributed to basewide background conditions or suspended solids in the samples (FPM Group, Ltd. [FPM], November 2004). Therefore, no further groundwater monitoring was recommended

and monitoring ceased. The Site SS017 (Lot 69) monitoring wells were decommissioned during the Round 5 well decommissioning event performed in winter 2008/2009.

A request to remove the groundwater restriction at the site was issued by the Air Force in March 2012 since no COCs were detected above NYSDEC Groundwater Standards at the site. NYSDEC acceptance was provided on June 7, 2012, and USEPA acceptance was provided on October 15, 2012.

Also, since the last Five-Year Review, annual LUC/IC inspections have been performed at the site to ensure that the LUCs/ICs continue to be implemented. The confirmation of the LUCs/ICs is obtained through on-site inspections and LUC/IC confirmation forms signed by the owner/occupant of the property.

## 1.3 Baseline HHRA Purpose

The purpose of this Baseline HHRA is to evaluate whether exposures to COPCs on Site SS017 (Lot 69), in the absence of a LUC, by future residents, poses a risk above the NCP risk range of 10-6 to 10-4 (one in a million to one in ten thousand) and/or the goal of protection of a Hazard Quotient (HQ) = 1 for an individual chemical or an HI for several chemicals = 1 (e.g., HQ or HI = 1). The Baseline HHRA also evaluated future exposures to a construction worker who may be exposed to soils at depths from the surface to the Water Table during future development of the property. The Baseline HHRA for these receptors evaluated future exposures and whether exposures posed unacceptable cancer risks and non-cancer hazards.

The remaining sections of this report provide information on the analyses conducted during each step of the Baseline HHRA. This report is organized according to the four steps of the risk assessment process (Section 1.1).

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# 2 HAZARD IDENTIFICATION

The purpose of the hazard identification section of the Baseline HHRA is:

- to evaluate the nature and extent of chemicals present at the Site, and
- to identify COPCs for further quantitative evaluation in the Baseline HHRA.

This Baseline HHRA focuses on the assessment of current and future risks, both cancer risks and non-cancer hazards, to human health associated with Site exposures at both depths, surface soil (0 to 2 ft bgs) and soils from the surface to the Water Table. Soils collected from the Site, at both depths, were quantitatively evaluated as a potential exposure media. The future exposure assessment, conducted in this Baseline HHRA, assumes future residential land use and no management of soils brought to the surface during excavation or other activities where future residents may be exposed. The assessment also evaluated a future construction worker exposed during digging, etc.

Sampling was conducted by the Air Force on the property on June 1 and 2, 2017. The samples were collected at depths from 0 to 2 ft bgs and 0 ft bgs to the Water Table. Samples were collected for TAL metals, pesticides/PCBs, PAHs, and VOCs.

The samples were collected and analyzed under a Quality Assurance Project Plan (Bhate, February 2017). The data was evaluated and determined to meet the quality assurance/quality control criteria and are appropriate for inclusion in the Baseline HHRA. The RAGS Part D Data Useability Worksheet is included in Appendix B of this Baseline HHRA.

## 2.1 Conceptual Site Model

The Conceptual Site Model (CSM) summarizes the sources of chemical contaminants, transport of contaminated media, routes of exposures, and receptors under current and future conditions. The CSM is presented in Appendix C - RAGS Part D Table 1 (USEPA, December 2001). The selection of exposure pathways and the rationale for inclusion of each pathway, using either quantitative or qualitative methods are as follows:

- Future Resident: The CSM identifies exposures to a future resident living on the Site who may be exposed to soils at both depths, under a future residential scenario. The assessment includes both a child (0 to 6 years) and an adult (older than 18 years) exposed for a total of 26 years (6 years as a child and 20 years as an adult) and a combined adult/child for the cancer assessment. Routes of exposure include inhalation, ingestion, and dermal contact with COPCs.
- Future Construction Worker: Exposures to a future construction worker were also evaluated in the assessment. The future construction worker is assumed to be an adult exposed to soils at both depths during future construction on the Site.

## 2.2 Selection of COPCs

Analytical data collected from soils at both depths is the basis for the COPCs determination.

The selection of COPCs were based on the following criteria:

- Known human carcinogens or chemicals classified as "carcinogenic to humans" regardless of whether the concentration exceeds the screening level (USEPA, December 1989).
- Maximum detected chemical concentrations greater than the residential soil screening level available in the April 2019 USEPA Regional Screening Level (RSL) table (USEPA, April 2019). The screening concentration is based on residential exposures associated with a cancer risk of 1 x 10-6 (or 1 in a million).
- Maximum detected concentration is greater than the concentration associated with HQ = 0.1 to address potential exposures to multiple chemicals with the same non-cancer health effects.
- The lower of the cancer risk and non-cancer hazard concentration were used to identify COPCs.

The criteria for excluding chemicals as COPCs include:

- Maximum soil concentration is below the RSL (described above) provided that the chemical is not a known human carcinogen or carcinogenic to humans.
- Essential nutrients (e.g., potassium, calcium, etc.).
- Chemicals detected in less than 5% of samples provided they are not classified as known human carcinogens or carcinogenic to humans.
- Chemicals lacking toxicity values are excluded from further quantitative evaluation but are discussed in the Uncertainty Section of the Risk Characterization (Section 5.4).

Appendix C - RAGS Part D Table 2 provides the determination of the status of the COPCs. Consistent with USEPA guidance (USEPA, December 2001), information provided in Appendix C - RAGS Part D Table 2 includes the minimum and maximum concentrations of chemicals identified in Site sampling including data qualifiers. The Table includes information on location of the maximum concentration, frequency of detection, RSL, and the screening conclusions rationale e.g., COPC or non-COPC.

A total of 136 chemicals were screened. The Table below summarizes the results of the screening and the classification groups of the individual chemicals.

| **Screening Criteria** | **Number of Chemicals** |
|---|---|
| Known Human Carcinogen (KHC) | 3 |
| Non-detect, Below Screening Level (ND, BSL) | 67 |
| Detections Below Screening Level (BSL) | 34 |
| Chemical not detected in sampling that are Above Screening Level (ND, ASL) | 2 |
| No Screening Level (NSL) | 13 |
| Maximum Concentration Above Screening Level (ASL) | 13 |
| Essential Nutrient (EN) | 4 |
| Total | 136 |

The identified COPCs are listed below by chemical category. The listed COPCs will be further evaluated and the calculated cancer risks and non-cancer hazards for these chemicals will be discussed in the Risk Characterization section of this Baseline HHRA (Section 5).

| Chemicals of Potential Concern |
|---|
| |
| **PAHs** |
| Benzo(a)anthracene |
| Benzo(a)pyrene |
| Benzo(b)fluoranthene |
| Dibenzo(a,h)anthracene |
| Indeno(1,2,3-cd)pyrene |
| **PCBs** |
| Aroclor 1260 |
| **Metals** |
| Aluminum |
| Arsenic (inorganic) |
| Chromium (VI) |
| Cobalt |
| Iron |
| Manganese (non-diet) |
| Vanadium |
| **Volatile Organic Compounds*** |
| Benzene |
| Trichloroethylene |
| Vinyl Chloride |
| * Benzene, trichloroethylene, and vinyl chloride were identified as COPCs based on the classification as known human carcinogens even though the highest concentration was ND (USEPA, December 1989, page 5-21). |

Chromium III was screened out as a COPC based on comparison of the maximum concentration to the RSL concentration for chromium III. In the absence of data on the valence of chromium in soil, the chemical was also assessed assuming all results are chromium VI, in the selection of COPCs. Based on the classification of chromium VI as a KHC, and the maximum concentration of chromium in soil, chromium VI was identified as a COPC assuming all data is chromium VI. This potential overestimate of cancer risks will be discussed in the Risk Characterization section of this Baseline HHRA (Section 5).

The screening level assessment also identified one chemical with the maximum ND concentration above the RSL. This exceedance of the screening level based on a ND concentration indicates a potential underestimate in risk. This potential uncertainty will be discussed in the Uncertainty Section of the Risk Characterization (Section 5.4).

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# 3 EXPOSURE ASSESSMENT

This section of the Baseline HHRA evaluates potential exposures for human receptors that will be used to estimate the cancer risks and non-cancer health hazards from exposures to COPCs at the Site. USEPA guidance (USEPA; December 1989, February 1992, May 1992b, May 1992c, and March 1995) provides the framework to be used in exposure assessments at Superfund Sites. The exposure assessment includes the identification of potentially exposed individuals, development of exposure scenarios, analysis of potential exposure pathways, and estimation of exposure point concentrations (EPCs) where the receptor may contact contaminated soils at both depths by the future resident and construction worker.

Information on receptor activities and concentrations in soil are used to estimate potential exposure doses under current and reasonably foreseeable land use conditions. This assessment assumes future residential exposures. The exposure assessment evaluates pathways by which receptors can be exposed to the COPCs in soil in the future.

The quantification of exposure is based on exposure factors including concentrations in soil at both depths, the potential exposure frequency (number of days per year), amount of soil consumed during activities (milligrams of soil ingested per body weight in kilograms per day or mg/kg-day), and the duration of exposure (number of years). The exposure assessment is based on site-specific parameters that can reasonably be expected at the Site, under a future residential scenario. The estimated exposures are presented in units of mg/kg-day.

USEPA guidance and policy call for an evaluation of cancer risks and non-cancer health hazards to the Reasonably Maximally Exposed Individual defined as “the maximum exposure that is reasonably expected to occur at the site” (USEPA, December 1989 and 1990). An estimate for the Reasonably Maximally Exposed Individual is obtained by determining estimates of likely "high-end" exposure factors and then combining these high-end factors with average exposure factors to develop a point estimate, or single exposure value, for the Reasonably Maximally Exposed Individual. A combination of USEPA recommended exposure values and site-specific values are used as input parameters in this assessment (USEPA, February 2014).

Decisions to take remedial action at a Site are based on exposures to the Reasonably Maximally Exposed Individual. If the risk range for the Reasonably Maximally Exposed Individual is exceeded, a Central Tendency Exposure (CTE) scenario is evaluated. The CTE evaluation provides additional information to the risk manager; however, consistent with the NCP, decisions regarding remedial action are based on the risks to the Reasonably Maximally Exposed Individual.

## 3.1 Exposure Point Concentrations

Individual EPCs were developed for each COPC at both depths (Appendix C - RAGS Part D Tables 3.1 and 3.2). Within the Site SS017 boundary, a total of 44 soil samples (including 4 duplicates) from 10 soil borings using direct push technology and six surface soil samples were collected. It is important to note that four soil borings (SS017-SB02, -SB04, -SB05, and –SB09) were drilled in the central portion of the asphalt parking lot and, as a result, surface soil samples were not

collected from these boreholes. The EPCs were calculated using ProUCL version 5.1 (USEPA, October 2015). The ProUCL computer program was developed for the USEPA to calculate EPCs that represent COPC exposures at Superfund sites. The EPC represents a 95% Upper Confidence Limit (UCL) on the Mean for each COPC. The maximum concentrations were used where statistical analysis is not calculated based on a small number of samples or limited number of detections. Note that the ND sample concentrations were replaced with half the detection limit to calculate the 95% UCL. The results of the EPC calculations are summarized in Appendix C - RAGS Part D Tables 3.1 and 3.2. The Tables include information on the sample concentrations, including the arithmetic mean, 95% UCL concentration, and maximum concentration along with the recommended EPC based on the computer output. The ProUCL outputs are provided in Appendix D.

The concentrations for benzene, trichloroethylene, and vinyl chloride are based on the maximum concentration in soils at both depths. The maximum concentration used is based on the finding that all samples are ND at both depths, however, the chemicals are included as they are classified with a Weight of Evidence (WOE) of KHC.

Comparison of the EPCs at both depths (Appendix C - Tables 3.1 and 3.2) indicate the concentrations are comparable. The sample results from each depth will be used to calculate the exposure dose and the resulting cancer risks and non-cancer hazards associated with the dose.

## 3.2 Exposure Receptors and Scenarios

The focus of this risk assessment was the evaluation of exposures at the Site for receptors who may come into direct contact with potentially contaminated soil at both depths. The Exposure Factors used in this assessment were primarily obtained from the *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (USEPA, February 2014). In the absence of default exposure factors, site specific exposure values were developed based on best professional judgment. RAGS Tables 4.4 a through 4.4c for cancer and non-cancer (e.g., averaging time [AT]) were combined to make the calculations more transparent. The exposure assumptions are the same for cancer and non-cancer except for the AT. The Tables include the AT for both cancer and non-cancer. The tables were modified to add an additional line for the AT for non-carcinogens. The decisions for remediation are based on a combination of the total cancer risk and the non-cancer HI for the young child, the most sensitive receptor. The age-adjusted value was calculated for the cancer risks only since the non-cancer assessment for the young child is the most sensitive receptor. Since the young child is the most sensitive receptor, the adult receptor itself was not evaluated.

Receptors include:

- **Future Resident:** Future residents are the most sensitive receptors based on potential exposures to a young child (i.e. 6 years and younger). However, the non-cancer value for the adult was also calculated. The assessment assumed exposures to an adult/child for the cancer assessment and to the young child (6 years and younger) for the non-cancer

assessment. If future land use changes, the risk quantified in this assessment will likely be protective of all other potential receptors. The future resident is assumed to be exposed to contamination at both depths assuming the resident may dig in the upper 2 ft of soil on their property and/or be exposed to soil brought to the surface during construction activities where contaminated soils are not managed.

The Baseline HHRA evaluated the following exposure pathways: incidental ingestion of soil, dermal contact with soil, and inhalation of volatiles and fugitive dust. The exposures included the young child (6 years and younger) and adults (18 years and older) exposed for 350 days/year for a period of 26 years (6 years as a child and 20 years as an adult).

Adults and children exhibit different ingestion rates for soil. For example, the soil ingestion rate for a child resident is 200 milligrams per day (mg/day) while the adult rate is 100 mg/day. The ingestion rate assumes exposures to both soil and dust tracked into the residence. To account for changes in intake rates as the receptor ages, age-adjusted intake equations are used for the adult/child in the cancer assessment. The calculations of exposure dose include adjustments for body weight and skin surface area based on age (e.g., child and adult) as described in Section 3.5 and listed in Appendix C - Tables 4.1(a), 4.1(b), 4.1(c), and 4.2.

- **Future Construction Worker:** The future construction worker is assumed to be exposed to soils at both depths during future construction work on the property. The exposure pathway assumes the construction worker wears no protective equipment to prevent exposure. Exposures are assumed to be short-term during the construction activities such as digging, tilling, etc. for a period of less than 1 year.

  The activities for this receptor typically involve on-site exposure to soils at both depths during construction. The construction worker is expected to have an elevated soil ingestion rate (330 mg/day) and is assumed to be exposed to contaminants via the following pathways: incidental ingestion of soil, dermal contact with contaminants in soil, and inhalation of volatiles and fugitive dust based on modeling.

  This receptor is limited to a subchronic exposure with a duration of 1 year and less. Other unique aspects of this scenario are that the Particulate Emission Factor (PEF) is based on mechanical disturbance of the soil. Exposure to volatiles are addressed using a Volatilization Factor (VF). These values are discussed in Section 3.3.

  The exposure model assumptions are provided in Appendix C – RAGS Tables 4.4(a), 4.4(b), and 4.4(c).

## 3.3 Exposure Models

Consistent with the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, December 2002a), exposure to particulates and volatiles were evaluated in the Exposure Assessment. This equation relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions. The variables used in the modeling include the PEF and the VF. Inhalation of contaminants adsorbed to respirable

particles (particulate matter [PM]10) were assessed using a default PEF equal to 1.36 x $10^9$ cubic meters per kilogram ($m^3$/kg).

The model equations incorporate a soil-to-air VF. The VF relates the concentration of a contaminant in soil to the concentration of the contaminant in air resulting from volatilization. A VF is available for benzo(a)anthracene (i.e., 4.41 x $10^6$), trichloroethylene (2.2 x $10^3$), and benzene (3.54 x $10^3$).

Equation 5-3 of the Supplemental Guidance (USEPA, December 2002a) was used to evaluate inhalation of volatiles and particulates emitted from soil. The following tables summarize the information used in these modeling calculations.

VFs for particulate emissions from soil to outdoor air are summarized below.

| Parameter Code | Parameter Definition | Value | Units | Rationale/Reference |
|---|---|---|---|---|
| $VF_p$ | Volatilization factor for particulate emissions | Chemical specific | kg-soil/$m^3$-air | Calculated |
| Q/C | Inverse of the mean concentration at the center of square source | 62.55 | (g/$m^2$-s)/ (kg/$m^3$) | USEPA, July 1996 |
| V | Fraction of Vegetative Cover | 0.5 | $m^2/m^2$ | USEPA, April 2019 |
| $U_m$ | Mean Annual Wind Speed | 2.68 | m/s | NOAA, 1998 |
| $U_t$ | Equivalent Threshold Value of Windspeed | 11.32 | m/s | USEPA, December 2002a |
| $F_{(x)}$ | Windspeed Distribution Function from Cowherd et. al, 1985 | 0.194 | unitless | USEPA, December 2002a |
| 0.036 | Empirical constant | 0.036 | g/$m^2$-hr | USEPA, December 2002a |
| Notes: kg-soil/$m^3$-air = kilograms of soil per cubic meter of air; g/$m^2$-s = grams per square meter-second; kg/$m^3$ = kilograms per cubic meter; $m^2$ = square meter; m/s = meters per second; g/$m^2$-hr = grams per square meter-hour; NOAA = National Oceanic Atmospheric Administration | | | | |

VFs for air emissions from soil to outdoor air are summarized below.

| Parameter Code | Parameter Definition | Value | Units | Rationale/Reference |
|---|---|---|---|---|
| $VF_{ss-i}$ | Surface soils volatilization factor for infinite sources | Chemical specific | kg-soil/$m^3$-air | Calculated |
| $VF_{ss-m}$ | Surface soils volatilization factor for finite (mass limit) sources | Chemical specific | kg-soil/$m^3$-air | Calculated |
| Q/C | Inverse of the mean concentration at the center of square source | 62.55 | (g/$m^2$-s)/ (kg/$m^3$) | USEPA, December 2002a |
| $D_A$ | Apparent diffusivity | Calculated | $cm^2/s$ | Calculated |

| Parameter Code | Parameter Definition | Value | Units | Rationale/Reference |
|---|---|---|---|---|
| $\tau$ | Averaging time for vapor flux | | | |
| | Child | 1.89E+08 | seconds | Calculated |
| | Adult | 6.31E+08 | seconds | Calculated |
| $\rho_s$ | Dry Soil Bulk Density in the Vadose Zone | 1.62 | $g/cm^3$ | USEPA, September 2017 |
| H | Dimensionless Henry's law constant | Chemical specific | unitless | USEPA, December 2002a |
| $K_{oc}$ | Organic carbon adsorption coefficient | Chemical specific | L/kg | USEPA, December 2002a |
| $D^a$ | Diffusivity in air | Chemical specific | $cm^2/s$ | USEPA, December 2002a |
| $D^w$ | Diffusivity in water | Chemical specific | $cm^2/s$ | USEPA, December 2002a |
| $f_{oc}$ | Fractional Organic Carbon Content in the Vadose Zone | 0.002 | g-C/g-soil | Professional judgment based on soil type |
| $\vartheta_T$ | Total Soil Porosity in the Vadose Zone | 0.39 | cc/cc | Professional judgment based on soil type |
| $\vartheta_{ws}$ | Volumetric Water Content in the Vadose Zone | 0.049 | cc/cc | Professional judgment based on soil type |
| $\vartheta_{as}$ | Volumetric Air Content in the Vadose Zone | 0.341 | cc/cc | Calculated |
| $d_s$ | Lower Depth of Surficial Soil Zone | | | |
| | 0 to 2 ft bgs | 60.96 | cm | Site-specific |
| | 0 ft bgs to Water Table | 161.85 | cm | Site-specific |

Notes: $cm^2/s$ = square centimeters per second; $g/cm^3$ = grams per cubic centimeter; L/kg = liters per kilogram; g-C/g-soil = grams carbon per grams soil; cc = cubic centimeter; cm = centimeters

## 3.4 Exposure Equations

Chemical intake is expressed in terms of dose units of mg/kg-day. In general, quantitative exposure estimates involve the following steps:

- Determining EPCs, the concentrations of COPCs in environmental media at the point of human exposure (Section 3.1);
- Identifying the applicable human exposure models and input parameters (exposure frequency, duration, etc.); and
- Estimating human intakes based on using exposure equations for ingestion, dermal contact, and inhalation.

The primary source for the exposure equations used in the equations and calculations is USEPA's RAGS, Parts A, B, D, E, and F (USEPA, December 1989, December 1991a, December 2001, July 2004, and January 2009, respectively).

### 3.4.1 Soil Ingestion

The generalized equation for calculating soil chemical intakes is:

$$\text{Intake (I) (mg/kg-day)} = \frac{C \times CR \times EF \times ED \times CF}{BW \times AT}$$

Where:

| | | |
|---|---|---|
| I | = | *Intake* - the amount of chemical at the exchange boundary (mg/kg-day) |
| C | = | *EPC* - the chemical concentration contacted over the exposure period at the exposure point (*e.g.*, mg/kg-soil) |
| CR | = | *Contact Rate* - the amount of affected medium contacted per unit time or event (*e.g.*, soil ingestion rate in grams per day [g/day]) |
| EF | = | *Exposure frequency* - describes how often exposure occurs (days/year) |
| ED | = | *Exposure duration* - describes how long exposure occurs in years |
| CF | = | *Conversion factor* – kilograms per gram (kg/g) |
| BW | = | *Body weight* - the average body weight over the exposure period (kilograms [kg]) |
| AT | = | *Averaging times (ATs)* - the period over which exposure is averaged (days)<br>The cancer and non-cancer ATs are:<br>Carcinogenicity AT is 70 years x 365 days/year, and<br>Non-cancer AT is 26 years x 365 days/year for all ages for the resident; 6 years x 365 days/year for the young child; 20 years x 365 days/year for the adult; and 1 year x 365 days for the construction worker |

### 3.4.2 Dermal Contact

For soil dermal contact, absorbed doses are used (USEPA, July 2004). Dermal intake (the amount absorbed into the body) is calculated as:

$$\text{Intake (mg/kg-day)} = \frac{C_{soil} \times DA \times AF \times SA \times EF \times ED \times CF}{BW \times AT}$$

Where:

| | | |
|---|---|---|
| $C_{soil}$ | = | Concentration of COPCs in soil (milligram per kilogram [mg/kg]) |
| DA | = | Dermal absorption factor (unitless) |
| AF | = | Soil adherence factor (milligrams per square centimeter [$mg/cm^2$]) |
| SA | = | Skin surface area exposed ($cm^2$/exposure event) |
| EF | = | Exposure frequency (exposure events/year) |
| ED | = | Exposure duration (years) |
| CF | = | Conversion factor ($10^{-6}$ kg/mg) |
| BW | = | Body weight (kg) |
| AT | = | Averaging times are the period over which exposure is averaged (days) |

The cancer and non-cancer ATs are:
Carcinogenicity AT is 70 years x 365 days/year, and
Non-cancer AT is 26 years x 365 days/year for all ages for the resident; 6 years x 365 days/year for the young child; 20 years x 365 days/year for the adult; and 1 year x 365 days for the construction worker

The dermal absorption factors are provided in Section 3.6.

### 3.4.3 Inhalation

$$EC \text{ (micrograms per cubic meter } [\mu g/m^3]) = \frac{CA \times ET \times EF \times ED}{AT \times ED}$$

Where:

EC = exposure concentration in $\mu g/m^3$
CA = contaminant concentration in air ($\mu g/m^3$)
ET = exposure time (hours/day)
EF = exposure frequency (days/year)
ED = exposure duration (years)
AT = Averaging times are the period over which exposure is averaged (days)
The cancer and non-cancer ATs are:
Carcinogenicity AT is 70 years x 365 days/year x 24 hours/day, and
Non-cancer AT is 26 years x 365 days/year x 24 hours/day for all ages for the resident; 6 years X 365 days/year x 24 hours/day for the young child; 20 years x 365 days/year x 24 hours/day for the adult; and 1 year x 365 days x 24 hours/day for the construction worker

Appendix C - RAGS Part D Tables 4.1 to 4.4 provide the specific exposure equations and parameters.

## 3.5 Exposure Parameters

Exposure parameters (e.g., contact rate, exposure frequency, exposure duration, body weight) describe the exposures of a receptor for a given exposure scenario. These values are input parameters for the exposure equations used to estimate chemical intake (USEPA, February 2014). Exposures to the future construction worker were based on assumptions for the worker exposed during the construction of a building. The exposure frequency and duration were adjusted to reflect the construction activities e.g., 1 year or less to complete the project.

Appendix C - RAGS Part D Tables 4.1 to 4.4 provide exposure assumptions for the individual receptors used to calculate cancer risk and non-cancer hazards.

## 3.6 Dermal Absorption Fractions

The dermal absorption fraction (DAF) accounts for absorption of chemicals through the skin. The DAFs for COPCs were compiled from RAGS Part E, Exhibit 3-4 (USEPA, July 2004). The DAFs used for the chemicals are listed below:

| Chemicals of Potential Concern | Dermal Absorption Factors |
|---|---|
| | |
| **PAHs** | |
| Benz(a)anthracene | 0.13 |
| Benzo(a)pyrene | 0.13 |
| Benzo(b)fluoranthene | 0.13 |
| Dibenzo(a,h)anthracene | 0.13 |
| Indeno(1,2,3-cd)pyrene | 0.13 |
| | |
| **Metals** | |
| Aluminum | Not Applicable |
| Arsenic (inorganic) | 0.03 |
| Chromium (VI) | Not Applicable |
| Cobalt | Not Applicable |
| Iron | Not Applicable |
| Manganese (non-diet) | Not Applicable |
| Vanadium | Not Applicable |
| | |
| **Polychlorinated Biphenyls** | |
| Aroclor 1260 | 0.14 |
| | |
| **Volatile Organic Compounds** | |
| Benzene | Not Applicable |
| Trichloroethylene | Not Applicable |
| Vinyl Chloride | Not Applicable |

## 3.7 Bioavailability

Absorption adjustment factors (AAFs) are used in risk assessment to account for differences in bioavailability between exposed humans and studies in laboratory animals used in deriving toxicity values. A bioavailability factor of 0.6 was applied for arsenic exposures (USEPA, December 2012). Bioavailability factors for the remaining chemicals are equal to 1.

# 4 TOXICITY ASSESSMENT – DOSE-RESPONSE

The toxicity assessment determines the types of adverse health effects potentially associated with exposures to COPCs at the Site and the relationship between the magnitude of exposure (dose) and severity of adverse effects (response). Toxicity relationships are developed using animal studies and theoretical concepts about what might occur in humans or where data is available based on human epidemiological evidence.

The result of a toxicity assessment is the development of toxicity values for both cancer and non-cancer health effects that are combined with exposure information (Section 3) to calculate cancer risks and non-cancer hazards. The calculated cancer risks and non-cancer hazards are then presented in the Risk Characterization Section (Section 5) with associated uncertainties. The calculated cancer risks and non-cancer hazards from the assessment are compared to the criteria identified in the NCP to support decisions regarding the LUCs/ICs.

## 4.1 Toxicity Hierarchy

In December 2003, the Office of Solid Waste and Emergency Response (OSWER, now referred to as the Office of Land and Emergency Management) issued a directive (USEPA, December 2003) outlining the hierarchy of toxicity values to be used in a risk assessment. The toxicity values for COPCs come from the following sources.

- Tier 1: Integrated Risk Information System (IRIS), which represents the USEPA's consensus database for cancer and non-cancer toxicity information.
- Tier 2: USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) developed by the USEPA's National Center for Environmental Assessment in the Office of Research and Development.
- Tier 3: Other sources of toxicity information such as the Agency for Toxicity Substances and Disease Registry (ATSDR) Toxicological Profiles, and other resources evaluated through the Superfund Technical Support Center and identified as appropriate for inclusion in the Baseline HHRA.

Appendix C provides the RAGS Part D Tables 5.1 through 5.4 and 6.1 and 6.2 that identify relevant endpoints and toxicity benchmarks. Tables 5.1 through 5.4 provide non-cancer toxicity values (i.e., reference doses [RfDs], and reference concentrations (RfCs, both chronic and subchronic). Tables 6.1 and 6.2 provide cancer toxicity information (e.g., cancer slope factors [CSFs], and inhalation unit risks [IURs]). Each table identifies the sources of the toxicity information consistent with the toxicity hierarchy Tiers listed above.

## 4.2 Non-cancer Health Effects

Non-cancer toxicity is evaluated using an oral RfD and/or an inhalation RfC. The following sections define the terms RfD and RfC and their derivation.

### 4.2.1 Oral Reference Dose

The RfD, in units of mg/kg-day, represents "an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime". RfDs are derived by first identifying the highest dose level that does not cause observable adverse effects (the no-observed-adverse-effect-level, or NOAEL). If a NOAEL was not identified, a lowest observed-adverse-effect-level, or LOAEL, may be used. This dose level is then divided by uncertainty factors to calculate an RfD. There are four standard uncertainty factors that can be used when calculating an RfD:

- An up-to-10-fold factor to account for the variation in sensitivity among members of the human population.
- An up-to-10-fold factor to account for the uncertainty involved in extrapolating from animal data to humans.
- An up-to-10-fold factor to account for the uncertainty involved in extrapolating from less than chronic NOAELs to chronic NOAELs.
- An up-to-10-fold factor to account for the uncertainty involved in extrapolating from LOAELs to NOAELs.

Appendix C - RAGS Part D – Table 5.1 provides the chronic toxicity oral RfD values used to assess non-cancer toxicity for the future resident. Table 5.3 provides the subchronic RfDs that are used in the calculation of non-cancer hazards for the construction worker.

### 4.2.2 Inhalation Toxicity Concentrations

RfCs provide the non-toxicity values for inhalation. The RfC is "an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime". Non-cancer toxicity values can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors, described above to reflect limitations of the data used. The RfC is expressed in units of milligrams per cubic meter ($mg/m^3$).

Appendix C - RAGS Part D - Tables 5.2 (Chronic) and 5.4 (Subchronic) provide toxicity data for non-cancer health effects associated with each COPC. The non-cancer health endpoint (i.e., the target organ) associated with each derived toxicity value for each chemical. The subchronic toxicity values for the COPCs are used in the calculation of the non-cancer HQ for the construction worker since the exposures are for less than 1 year. Chemicals lacking subchronic RfCs are quantitatively evaluated and this uncertainty is discussed in Section 5.

### 4.2.3 Interpretation of Non-Cancer Assessments

The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period (i.e., lifetime) with a RfD (expressed in the same units) derived for a similar exposure period (i.e. chronic). This ratio of exposure to toxicity is referred to as the HQ. A target

organ HQ ≤ 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-cancer health effects from that chemical are unlikely. A determination that the HQ is greater than 1 indicates the potential for non-cancer health effects depending on the magnitude of the HQ.

The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time frame (e.g., chronic or subchronic) with the RfC. The HI is generated by adding the HQs for the individual COPCs that affect the same target organ or act through the same mechanism of action within a medium or across all media to which an individual may reasonably be exposed. An HI ≤ 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, adverse toxic non-cancer health effects from all contaminants are unlikely. An HI > 1 indicates that a site related exposure may present a hazard to human health and it is important to evaluate toxicity by target organ based on the critical effect used in the development of the toxicity value. Those chemicals posing effects on the same target organ with an HI > 1 require further discussion in the Risk Characterization section of the Baseline HHRA.

Chemicals lacking non-cancer toxicity information are qualitatively evaluated in the Risk Characterization and the Uncertainty Sections (Section 5).

## 4.3 Carcinogenic Effects

Chemicals with the potential to cause cancer are classified based on the WOE for each chemical. The WOE is used to characterize the extent to which the available human epidemiology and animal studies indicate that a chemical may cause cancer in humans. The WOE includes classifications such as known human carcinogens, likely to be carcinogenic to humans, possible human carcinogen, not classifiable as to carcinogenicity, or not carcinogenic to humans (USEPA, March 2005a).

The cancer slope factor, or CSF, is a plausible upper bound estimate of carcinogenic potency used to calculate cancer risk from exposure to carcinogens, by relating estimates of lifetime average chemical intake to the incremental probability of an individual developing cancer over a lifetime. The CSFs developed by the USEPA are plausible upper bound estimates, which means that the USEPA is reasonably confident that the actual cancer risk will not exceed the estimated risk calculated using the CSF.

An IUR is used to assess exposures through inhalation. The IUR is an upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration in air in units of micrograms per cubic meter $(\mu g/m^3)^{-1}$.

Appendix C - RAGS Part D - Tables 6.1 and 6.2 provide dose-response information in the form of the CSF for the ingestion and dermal contact routes and the IUR for exposure via inhalation, where toxicity information is available. The Tables also provide the WOE and the CSF and IUR for each chemical with adequate information.

For PAHs, a Relative Potency Factor (RPF) was applied (USEPA, July 1993). The RPF reflects the toxicity based on the base chemical, benzo(a)pyrene.

For carcinogens, cancer risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime from exposure to the carcinogen. The upper-bound excess lifetime cancer risk is estimated by multiplying the lifetime exposure estimated in the exposure assessment by the CSF or IUR identified in the toxicity assessment. These risks represent probabilities usually expressed in scientific notation. An excess lifetime cancer risk of 1 x 10-6 indicates that an individual experiencing the RME estimated in the exposure assessment has a 1 in 1,000,000 probability of developing cancer from Site-related exposure(s).

The NCP, the regulation that implements the Superfund law, defines the range for determining whether action is necessary as an individual excess lifetime cancer risk of 1 in a million (1 x 10-6) to 1 in 10,000 (1 x 10-4). The decision to take remedial action is based on the cancer risk to the Reasonably Maximally Exposed Individual. Risks to the average or CTE individual are calculated when the risks exceed the risk range but this information is not used in the evaluation of the need for remedial action.

## 4.4 COPCs with a Mutagenic Mode of Action

The *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (USEPA, March 2005b) recommends the application of Age Dependent Adjustment Factors (ADAFs) for chemicals identified with a mutagenic mode of action (MMOA). The ADAFs are:

- Ages 0-2: ADAF = 10
- Ages 2-6: ADAF = 3
- Ages 6-16: ADAF = 3
- Ages >16: ADAF = 1

The COPCs with a MMOA include: chromium VI; the PAHs including benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; dibenzo(a,h)anthracene; indeno(1,2,3-cd)pyrene; trichloroethylene; and vinyl chloride. The assessment applied ADAFs consistent with the Supplemental Guidance (USEPA, March 2005b) for the future child resident. On the basis of sufficient evidence for carcinogenicity in human epidemiology studies, trichloroethylene and vinyl chloride have established quantitative estimates for exposures. Therefore, the recommendations in the IRIS file for evaluating the MMOA were followed for these chemicals. Appendix E provides the calculations used in determining the cancer risks for chemicals with a MMOA.

## 4.5 Gastrointestinal Absorption Factors

Gastrointestinal Absorption Factor (GIAB) values are used to convert oral slope factors (administered dose) to dermal slope factors (administered dose) by factoring out the percentage eliminated in bodily waste. GIABs were applied consistent with the RAGS Part E Guidance regarding dermal assessment (USEPA, July 2004).

## 4.6 Subchronic Toxicity Values

Only a limited number of chemicals had subchronic toxicity values for inclusion in the non-cancer hazard assessment for the construction worker. Subchronic toxicity values were applied consistent with the RAGS Part A Guidance (USEPA, December 2001). Specifically, the May 2019 Subchronic Toxicity Supporting Table does not provide information for inorganic arsenic, manganese, PAHs, vinyl chloride, or trichloroethylene and therefore are not assessed for the construction worker.

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# 5 RISK CHARACTERIZATION

The final step in a Baseline HHRA combines exposure and toxicity information to provide a quantitative assessment of Site cancer risks and non-cancer hazards. Exposures are evaluated based on the potential risk for developing cancer and the non-cancer health hazards (Sections 3 and 4, respectively).

The calculated cancer risks and non-cancer hazards are provided based on sampling depths for the future resident and construction worker. A current assessment was not conducted since the area is currently used in accordance with the established LUCs and ICs.

## 5.1 Calculated Cancer Risks and Non-cancer Health Hazards-Future Resident

### 5.1.1 Future Resident Exposures to Depths 0 to 2 ft bgs

Appendix C - Tables 7.1(a) and 7.1(b) provide the cancer risks and non-cancer hazards from exposure to soils under a future residential land use based on soils at depths of 0 to 2 ft bgs. The total cancer risk was 1.8 x 10-4 and the non-cancer HI was 1.8 for the young child. The cancer risk is within the upper bounds of the risk range. The non-cancer HI slightly exceeded the goal of protection of an HI = 1 (HI = 1.8). The non-cancer hazard for an adult was 0.21 which is less than an HI = 1.

Appendix C - Table 9.1 provides the calculated cancer risks and non-cancer hazards across exposure pathways. The cancer assessment indicates the main chemical contributing to the total risk is benzo(a)pyrene (1 x 10-4). Chromium VI is the next largest contributor with a risk of 2.8 x 10-5; however, this may be an overestimate of risk based on the assumption that all detected concentrations are chromium VI. Other contributors include benzo(b)fluoranthene (1.4 x 10-5), and benzene and dibenzo(a,h)anthracene with risks of 1.2 x 10-5 each.

The total non-cancer HI was 1.8 which slightly exceeds the goal of protection of an HI = 1. Consistent with the Supplemental Chemical Mixtures Guidelines (USEPA, August 2000), the assessment also evaluated non-cancer hazards based on target organ associated with toxicity values and this HQ was less than 1 (Appendix C – RAGS Part D Table 9.1). The highest HI for impacts was 0.66 for developmental effects from exposure to benzo(a)pyrene. The next highest HI was from neurological effects for aluminum and manganese (non-diet) and was calculated to be 0.35. The calculated non-cancer value for the adult are below the goal of protection of an HI = 1

### 5.1.2 Future Resident Exposures to Depths of 0 ft bgs to the Water Table

Appendix C - Tables 7.2(a) and 7.2(b) provide the cancer risks and non-cancer hazards from exposure to soils under a future residential land use based on soils at depths of 0 ft bgs to the Water Table. The total cancer risks was 7.5 x 10-5 and the non-cancer HI was 1.2 for a child. The cancer risk is within the risk range established under the NCP and the non-cancer HI slightly

exceeded the goal of protection of an HI = 1. The non-cancer HI is 0.13 for an adult which is less than the goal of protection of an HI = 1.

Appendix C - Table 9.2 provides the calculated cancer risks across exposure pathways and the non-cancer health hazards across pathways with associated health effects for each chemical. The cancer assessment indicates the risks are within the risk range established under the NCP. The main chemicals exceeding the risk range were chromium VI (3.1 x 10-5) and benzo(a)pyrene (2.7 x 10-5). The total non-cancer HI was 1.2 which slightly exceeds the goal of protection of an HI = 1. Consistent with the Supplemental Chemical Mixtures Guidelines (USEPA, August 2000), the assessment also evaluated non-cancer hazards based on target organ associated with toxicity values and this HQ was less than 1. The highest HI for impacts was 0.32 for the nervous system from exposures to aluminum and manganese (non-diet). The next highest HI for impacts on the gastrointestinal (GI) tract was 0.28 from exposure to iron and chromium VI. The remaining target organs were below an HI = 1. The calculated non-cancer value for the adult are below the goal of protection of an HI = 1.

## 5.2 Calculated Cancer Risks and Non-cancer Health Hazards-Construction Worker

### 5.2.1 Future Construction Worker Exposures to Depths 0 to 2 ft bgs

Appendix C - Table 7.3 provide the cancer risks and non-cancer hazards from exposure to soils under future construction worker exposures based on soils at depths of 0 to 2 ft bgs. The total cancer risk was 1.6 x 10-7 and the non-cancer HI was 0.2. The cancer risk is below the risk range established under the NCP and the non-cancer HI is below the goal of protection of an HI = 1.

Appendix C - Table 9.3 provides the calculated cancer risks across exposure pathways and the non-cancer health hazards across pathways with associated health effects for each chemical. The Table also provides an analysis of the non-cancer hazards. The cancer assessment indicates the risks are within the risk range established under the NCP. Based on the results with the cancer risk below the risk range and the non-cancer HI below 1, further analysis of the results is not necessary.

### 5.2.2 Future Construction Worker Exposures to Depths 0 ft bgs to the Water Table

Appendix C - Table 7.4 provides the cancer risks and non-cancer hazards from exposure to soils under a future construction worker scenario based on soils at depths of 0 ft bgs to the Water Table. The total cancer risk was 7.2 x 10-8 and the non-cancer HI was 0.2. The cancer risk is below the risk range established under the NCP and the non-cancer HI is below the goal of protection of an HI = 1.

Appendix C - Table 9.4 provides the calculated cancer risks across exposure pathways and the non-cancer health hazards across pathways with associated health effects for each chemical. The Table also provides an analysis of the non-cancer hazards. The cancer assessment indicates the risks are within the risk range established under the NCP. Based on the results with the cancer

risk below the risk range and the non-cancer HI below 1, further analysis of the results is not necessary.

## 5.3 Central Tendency Exposures to a Future Resident

Consistent with the Risk Characterization Handbook (USEPA, December 2000), the average exposures to the future resident were evaluated using an average exposure assumption for time of residence (e.g., 12 years for the adult and child). The CTE risk calculations provide information on average exposures; however, decisions are based on the Reasonably Maximally Exposed Individual.

The Baseline HHRA utilized the EPCs calculated in Appendix C – RAGS Part D Table 3.1. For clarity, the Table was reproduced in Appendix F – RAGS Part D Table 3.1 for the EPC for Soils 0 to 2 ft bgs. The Exposure Assumptions are provided in Appendix F – RAGS Part D Tables 4.1 to 4.3. The changes in the exposure assumption to evaluate average exposures was the inclusion of the average time an individual resides in a residence based on data provided in the 2011 Exposure Factors Handbook (Chapter 16, page 16-2 that states: The mean and 90th percentile for residential occupancy period from Johnson and Capel (1992) are 12 years and 26 years, respectively. The selection of 12 years is consistent with the value of 26 years identified in the *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors.* (USEPA, February 2014). The exposure duration is the only input parameter change when determining the CTE. Subchronic toxicity values were not used in this assessment since the individual would be exposed for a chronic period of time (e.g., greater than 7 years). Mutagenic chemicals are included in the CTE as a sum across the age range to provide a total cancer risk.

The RAGS Part D Tables for CTE are provided in Appendix F and the titles are listed below.

Table 4 (CTE) Exposure Assumptions
- Table 4.1 (CTE) Average Residential Exposures from 0 to 2 ft bgs From Exposure through Ingestion
- Table 4.2 (CTE) Average Residential Exposure Assumption for Exposures through Dermal Exposure to Soils From 0 to 2 ft bgs
- Table 4.3 (CTE) Average Residential Exposure Assumptions for Exposures through Inhalation Exposures to Soils From 0 to 2 ft bgs and 0 ft bgs to the Water Table

Table 7.1 (CTE) Calculated Cancer Risks and Non-cancer Hazards From Average or CTE exposures under a Residential Scenario (0 to 2 ft bgs)

Table 9.1 (CTE) Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 feet bgs (Adult/Child Resident –Cancer and Child – Non-cancer) Reasonable Maximum Exposure (RME) – Future Resident

Based on the assumption of residential exposures for a total of 12 years, the calculated cancer risks were 1.6 x 10-4 and the non-cancer hazards were an HI = 1.8, however the hazards from the individual chemicals based on target organ were below an HI = 1.

The assessment of CTE calculated risks indicate that the main contributor to the cancer risks were from benzo(a)pyrene (9.5 x 10-5) and chromium VI (2.6 x 10-5). As indicated above for the RME cancer risks, there is a potential overestimate of the risks from exposure to chromium based on the lack of speciated data for chromium and the assumption that exposures are only to chromium VI.

## 5.4 Uncertainty

The process of evaluating human health cancer risks and non-cancer health hazards involves multiple steps. As in any risk assessment, the estimates of potential health effects (cancer risks and non-cancer health hazards) have numerous associated uncertainties. The primary areas of uncertainty and limitations are qualitatively discussed here. The main areas of uncertainty in this Baseline HHRA include the environmental data used to conduct the risk assessment, the exposure parameter assumptions, the toxicological information used in the assessment, and the risk characterization when there is a mixture of chemicals present at a site. In general, the main sources of uncertainty include:

- Environmental chemistry sampling and analysis
- Environmental parameter measurement
- Fate and transport modeling
- Exposure parameter estimation
- Toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would contact the COPCs, the time period over which such exposures would occur, and in the models used to estimate the concentrations of the COPCs at the point of exposure. The Baseline HHRA assumes that concentrations of contaminants remain constant for the duration of exposure, which is most likely not the case.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making exposure assumptions consistent with the RME concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the site, and is unlikely to underestimate actual risks related to the site.

For the dermal exposure to soil pathway, there are also uncertainties, such as: a) not all chemicals have scientifically established dermal absorption values for soil and therefore may be left out of

the quantitative assessment, b) sometimes soil to skin adherence factors do not match exactly with site conditions, and c) exposed skin surface area and exposure frequency may change seasonally, which may not be adequately accounted for in the exposure parameters used to represent the RME scenario.

Additional sources of uncertainty identified in this Baseline HHRA include the following:

- Chromium: The assumption that the concentration of chromium is 100% chromium VI may overestimate cancer risks and non-cancer hazards. In the environment, the potential exists that exposures may include concentrations of various species of chromium.
- Lack of toxicity information: Fifteen chemicals were not screened in the selection of COPCs based on a lack of toxicity information. This may result in a potential underestimate of cancer risks and non-cancer hazards based on a lack of toxicity information.
- Screening Level Above Detection Limit: One chemical had detection limits above the screening level that did not allow for the evaluation of potential risks. This may lead to an underestimate in risks.
- Subchronic Toxicity Information: Only a limited number of chemicals had subchronic toxicity values for inclusion in the non-cancer hazard assessment for the construction worker. As noted in Section 4.6 and Table 5.3, the May 2019 Subchronic Toxicity Supporting Table does not provide information for inorganic arsenic, manganese, vinyl chloride, PAHs, or trichloroethylene and are therefore not assessed for the construction worker. PAHs are the primary COPCs for Site SS017. Lack of subchronic toxicity values for COPCs, particularly PAHs, may lead to an underestimate in the non-cancer health hazards.
- Bioavailability: Data on bioavailability of chemicals is limited to arsenic. USEPA's guidance (USEPA, December 2012) indicates: "… recent bioavailability studies conducted in animal models show that bioavailability of arsenic in soil is typically less than that of highly water soluble forms of arsenic (e.g., sodium arsenate dissolved in water). This suggests that bioavailability of arsenic in soil will typically be less than that of arsenic dissolved in drinking water (i.e., [relative bioavailability] RBA <100%)." This assessment used the default value of 60% that may over estimate risks based on the species of arsenic in soil.

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# 6 SUMMARY AND CONCLUSIONS

The results of the risk assessment indicate that the risks to the future resident are within the upper bounds of the risk range (USEPA, December 1991b). The non-cancer hazards based on Target Organs were below the goal of protection of an HI = 1.

The cancer risks to the future construction worker were below the goal of protection of 1 x 10-6 or one in a million. The non-cancer hazards were also below the goal of protection of an HI = 1.

Based on the results of the cancer assessment for the future resident exposed to soils at depths of 0 to 2 ft bgs, a risk management discussion regarding PAH impacts (e.g., benzo(a)pyrene) from the asphalt paved parking lot that covers approximately 70% of the Site SS017 footprint is provided in Section 5.4.1 of the Supplemental Site Investigation Report (Bhate, August 2019).

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# APPENDIX A
# FIGURES

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**Former Griffiss AFB Site Location Map**

**Figure 1**

Human Health Risk Assessment
SS017: Lot 69
Former Griffiss Air Force Base, Rome, New York

| DRAWN BY: | DATE: | SCALE: | PROJECT NO: |
|---|---|---|---|
| MRM | 1/22/2019 | As Shown | AFCGSA3.0012.00AA.2020.0002 |

bhate

Site SS017 (Lot 69) - Former Hazardous Waste Storage Area Showing Soil Sample Locations (June 2017)

Figure 2

Human Health Risk Assessment
SS017: Lot 69
Former Griffiss Air Force Base, Rome, New York

DRAWN BY: MRM

DATE: 1/22/2019

SCALE: As Shown

PROJECT NO: AFCGSA3.0012.00AA.2020.0002

Notes:
This information is depicted to provide visual aid within the context of this document and should not be used as a sole reference in precise dimensioning of features indicated. Please verify the location of all features including underground and aboveground utilities prior to conducting any subsurface exploration or site assessment.

0 50 100 200 Feet

Legend:
- Sample Locations
- Installation Restoration Program (IRP) Area
- Parcel Boundary
- 5657 Building Number
- 0781 Demolished Building Location

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

# APPENDIX B
# DATA USEABILITY WORKSHEET

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**DATA USEABILITY WORKSHEET**
**SS017 Griffiss AFB**
**Medium: Soil**

| Activity | Comment |
|---|---|
| **Field Sampling** | |
| Discuss sampling problems and field conditions that affect data usability. | There were no apparent problems that could affect data usability. |
| Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)? | Yes. Soil samples are representative of receptor exposure for this medium. |
| Assess the effect of field QC results on data usability. | Overall, the trip blanks were generally non-detect for VOCs with the exception of low levels detections of the common laboratory contaminant (acetone). |
| Summarize the effect of field sampling issues on the risk assessment, if applicable. | There are no field sampling issues that should affect the risk assessment. |
| **Analytical Techniques** | |
| Were the analytical methods appropriate for quantitative risk assessment? | Yes. Samples were analyzed for organic and inorganic compounds according to DoD ELAP certification and/or New York NELAP certification. TestAmerica Denver holds both DoD ELAP and NY NELAP certifications for method 8260B. The reporting limits for all analytes are much lower by 8260B compared to 8260C. Along with, EPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration SOM02.4 and EPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods Multi-Media, Multi-Concentration ISM02.4. |
| Were detection limits adequate? | Yes. The detection limits were less than the associated risk-based concentration (RBC) values. |
| Summarize the effect of analytical technique issues on the risk assessment, if applicable. | There are no analytical technique issues that should affect the risk assessment. |

**DATA USEABILITY WORKSHEET (cont.)**
**SS017 Griffiss AFB**
**Medium: Soil**

| Activity | Comment |
|---|---|
| **Data Quality Objectives** | |
| Precision - How were duplicates handled? | Relative percent differences (RPDs) were calculated for two pairs of duplicate samples. If the RPDs were greater than the project defined RPD of 50% for soils both data points were qualified estimated and flagged "J". The highest concentration of a compound detected in the samples was used in the risk assessment. |
| Accuracy - How were split samples handled? | Split samples were not collected. |
| Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody | Analytes qualified with a "UB" due to blank contamination will be considered as non-detects during the risk assessment. |
| Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.). | No problems were associated with data completeness. |
| Comparability - Indicate any problems associated with data comparability. | No problems have been associated with data comparability. |
| Were the DQOs specified in the QAPP satisfied? | Yes, the DQOs identified in the Sampling and Analysis Plan were satisfied. |
| Summarize the effect of DQO issues on the risk assessment, if applicable. | There are no DQO issues that should affect the risk assessment. |

**DATA USEABILITY WORKSHEET (cont.)**
**SS017 Griffiss AFB**
**Medium: Soil**

| Activity | Comment |
|---|---|
| **Data Validation and Interpretation** | |
| What are the data validation requirements? | For organic samples, validators were required to check the following items: holding times, instrument performance checks, initial and continuing calibrations, blanks, system monitoring compounds, matrix spike/matrix spike duplicates, regional QA/QC, internal standards, contract required quantitation limits, system performance, and overall assessment of data. For inorganic samples, validators were required to check holding times, calibration, blanks, interference checks, laboratory control samples, lab duplicate samples, matrix spike samples, ICP serial dilution, sample result verification, field duplicates, and perform an overall assessment of the data. |
| What method or guidance was used to validate the data? | USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (August 2014) and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (August 2014) and the Uniform Federal Policy-Quality Assurance Project Plan [UFPQAPP], Supplemental Investigation at Sites SS017: Lot 69, DP022: Building 222, and SS025: T-9 Storage Area, Former Griffiss Air Force Base, Rome, New York (February 2017) |
| Was the data validation method consistent with guidance? Discuss any discrepancies. | Yes. The data validation method was consistent with regional guidance. |
| Were all data qualifiers defined? Discuss those which were not. | Yes. All data qualifiers were defined. |
| Which qualifiers represent usable data? | UB, J, U and UJ |
| Which qualifiers represent unusable data? | R |
| How are tentatively identified compounds handled? | No TICs were reported. |

**DATA USEABILITY WORKSHEET (cont.)**
**SS017 Griffiss AFB**
**Medium: Soil**

| Activity | Comment |
|---|---|
| Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable. | Unusable data qualified with an "R" will not be used in the risk assessment. All other data, both qualified and unqualified, will be used in the risk assessment. |
| Additional notes: | None. |

# APPENDIX C
# RAGS PART D TABLES

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**RAGS Part D - Table 1 - Conceptual Site Model**
**Selection of Exposure Pathways**
**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|---|---|---|---|---|---|---|---|---|
| Future Residential Land Use | Soil * | Ambient air vapors | Breathing zone based on modeling | Resident | Child (for non-cancer), and Age-adjusted for Cancer Assessment | Outdoor inhalation of particulates from soil. Potential exposure to particulates in soil will be evaluated using Particulate Emission Factor Wind Driven. | Quantitative | The assessment evaluated future residential use of Site SS-017. The assessment quantitatively evaluated future residents exposed to soils at depths of 0 ft bgs to 2 ft bgs and 0 ft bgs to the Water Table. Potential soil exposures include ingestion, dermal contact, and inhalation of soil particulates and volatilized chemicals. Under a future scenario, soil exposures consider the potential for soils at both depths to be brought to the surface where exposures may occur in the event that soils are not managed appropriately. Exposures of future residents to surface soils brought to surface is considered a potentially complete exposure pathway. This exposure scenario will be quantitatively evaluated in the risk assessment for the adult/child exposures adjusted for cancer and a separate evaluation of the young child for exposures under a future scenario for non-cancer health effects. The child is considered the most sensitive receptor for the non-cancer evaluation. |
| | | Ambient particulates | | | | Outdoor inhalation of volatiles from soil for those chemicals with Volatilization Factors. | Quantitative | |
| | | Soil | Soil from 0 to 2 feet below ground surface (ft bgs) and 0 ft bgs to the Water Table | | | Dermal contact with soil | Quantitative | |
| | | | | | | Incidental ingestion of soil at both depths | Quantitative | |
| | | Ambient air vapors | Breathing zone based on modeling | Construction worker | Adult | Outdoor inhalation of vapors from soil for those chemicals with volatilization factors. | Quantitative | Site SS-017 is evaluated under a future residential land use scenario where the potential exists that a construction worker may be exposed to contaminated soils at depths from 0 to 2 ft bgs and/or 0 ft bgs to the Water Table. The assessment will quantitatively evaluate potential soil exposures through direct contact (ingestion and dermal contact) and inhalation of vapors and particulates by a construction worker during future construction activities. |
| | | Ambient particulates | | | | Outdoor inhalation of particulates from soil. Potential exposure to particulates in soil will be evaluated using Particulate Emission | Quantitative | |
| | | Soil | Soil from 0 ft bgs to 2 ft bgs and 0 ft bgs to the Water Table | | | Dermal contact with soil | Quantitative | |
| | | | | | | Incidental ingestion of soil at both depths | Quantitative | |

* Soil concentrations were used to calculate ambient air vapors and ambient particulates depending on chemical specific information chemical specific particulate emission factors and volatilization factors for individual chemicals. The values are based on the EPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002a).

**RAGS Part D - Table 2 - Chemicals of Potential Concern (0 ft bgs to Water Table)**

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil (0 ft bgs to the Water Table - All Data)
Exposure Medium: Soil

| Exposure Point | CAS Number | Chemicals | Minimum Concentration (Qualifier) (1) | Maximum Concentration (Qualifier) (1) | Units | Location of Maximum Concentration | Detection Frequency (%) | Range of Detection Limits | Concentration Used for Screening (2) | Background Value (3) | Screening Toxicity Value (N/C) (4) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag (Y/N) | Rationale for Selection or Deletion (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | 630-20-6 | 1,1,1,2-Tetrachloroethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 2.0 C | | | N | AND, BSL |
| | 71-55-6 | 1,1,1-Trichloroethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 810 N | | | N | AND, BSL |
| | 79-34-5 | 1,1,2,2-Tetrachloroethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 0.6 C | | | N | AND, BSL |
| | 79-00-5 | 1,1,2-Trichloroethane | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 0.15 N | | | N | AND, BSL |
| | 75-34-3 | 1,1-Dichloroethane | < 0.0006 (ND) | 0.0028 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 3.6 C | | | N | AND, BSL |
| | 75-35-4 | 1,1-Dichloroethene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 23 N | | | N | AND, BSL |
| | 563-58-6 | 1,1-Dichloropropene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | AND, BSL |
| | 87-61-6 | 1,2,3-Trichlorobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 6.3 NC | | | N | AND, BSL |
| | 96-18-4 | 1,2,3-Trichloropropane | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 0.0051 C | | | N | AND, ASL |
| | 120-82-1 | 1,2,4-Trichlorobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 5.8 N | | | N | AND, BSL |
| | 95-63-6 | 1,2,4-Trimethylbenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 30 N | | | N | AND, BSL |
| | 96-12-8 | 1,2-Dibromo-3-Chloropropane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 0.0053 C | | | N | AND, BSL |
| | 106-93-4 | 1,2-Dibromoethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 0.036 C | | | N | AND, BSL |
| | 95-50-1 | 1,2-Dichlorobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 180 N | | | N | AND, BSL |
| | 107-06-2 | 1,2-Dichloroethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 0.46 C | | | N | AND, BSL |
| | 540-59-0 | 1,2-Dichloroethene, Total | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 16 N | | | N | AND, BSL |
| | 78-87-5 | 1,2-Dichloropropane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 1.6 N | | | N | AND, BSL |
| | 108-67-8 | 1,3,5-Trimethylbenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 27 N | | | N | AND, BSL |
| | 541-73-1 | 1,3-Dichlorobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | NSL |
| | 142-28-9 | 1,3-Dichloropropane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 160 NC | | | N | AND, BSL |
| | 106-46-7 | 1,4-Dichlorobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 2.6 C | | | N | AND, BSL |
| | 594-20-7 | 2,2-Dichloropropane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | NSL |
| | 78-93-3 | 2-Butanone (MEK) | 0.005 (J) | 0.011 (J) | mg/kg | SB08 | 5 | 0.0048-0.011 | 0.0110 | | 2,700 N | | | N | BSL |
| | 95-49-8 | 2-Chlorotoluene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 160 N | | | N | AND, BSL |
| | 591-78-6 | 2-Hexanone | < 0.0096 (ND) | < 0.023 (ND) | mg/kg | | 0 | 0.0096-0.023 | 0.0230 | | 20 N | | | N | AND, BSL |
| | 106-43-4 | 4-Chlorotoluene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 160 N | | | N | AND, BSL |
| | 99-87-6 | 4-Isopropyltoluene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0.0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | NSL |
| | 108-10-1 | 4-Methyl-2-pentanone (MIBK) | < 0.0096 (ND) | <0.023 (ND) | mg/kg | | 0 | 0.0096-0.023 | 0.0230 | | 3,300 N | | | N | AND, BSL |
| | 67-64-1 | Acetone | 0.0145 | 0.0145 | mg/kg | SB10 | 2.5 | 0.0057-0.088 | 0.0145 | | 6,100 N | | | N | BSL |
| | 71-43-2 | Benzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 1.2 C | | | Y | KHC |
| | 108-86-1 | Bromobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 29 N | | | N | AND, BSL |
| | 74-97-5 | Bromochloromethane | < 0.0006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 15 N | | | N | AND, BSL |
| | 75-27-4 | Bromodichloromethane | < 0.0006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 0.29 N | | | N | AND, BSL |
| | 75-25-2 | Bromoform | < 0.0006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 19 N | | | N | AND, BSL |
| | 74-83-9 | Bromomethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 0.68 N | | | N | AND, BSL |
| | 75-15-0 | Carbon disulfide | 0.0012 (J) | 0.0012 (J) | mg/kg | SB01 | 2.5 | 0.0012-0.0028 | 0.0012 | | 77 N | | | N | BSL |

**RAGS Part D - Table 2 - Chemicals of Potential Concern (0 ft bgs to Water Table)**

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil (0 ft bgs to the Water Table - All Data)
Exposure Medium: Soil

| Exposure Point | CAS Number | Chemicals | Minimum Concentration (Qualifier) (1) | Maximum Concentration (Qualifier) (1) | Units | Location of Maximum Concentration | Detection Frequency (%) | Range of Detection Limits | Concentration Used for Screening (2) | Background Value (3) | Screening Toxicity Value (N/C) (4) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag (Y/N) | Rationale for Selection or Deletion (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 56-23-5 | Carbon tetrachloride | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 0.65 C | | | N | AND, BSL |
| | 108-90-7 | Chlorobenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 28 N | | | N | AND, BSL |
| | 75-00-3 | Chloroethane | < 0.0024 (ND) | <0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 1,400 N | | | N | AND, BSL |
| | 67-66-3 | Chloroform | < 0.0006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 0.32 C | | | N | AND, BSL |
| | 74-87-3 | Chloromethane | < 0.0006 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 11 N | | | N | AND, BSL |
| | 156-59-2 | cis-1,2-Dichloroethene | < 0.0012 (ND) | < 0.0026 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0026 | | 16 N | | | N | AND, BSL |
| | 10061-01-5 | cis-1,3-Dichloropropene | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | NA | | | N | NSL |
| | 124-48-1 | Dibromochloromethane | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 8.3 C | | | N | AND, BSL |
| | 74-95-3 | Dibromomethane | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 2.4 N | | | N | AND, BSL |
| | 75-71-8 | Dichlorodifluoromethane | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 8.7 N | | | N | AND, BSL |
| | 100-41-4 | Ethylbenzene | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 5.8 C | | | N | AND, BSL |
| | 87-68-3 | Hexachlorobutadiene | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 1.2 C | | | N | AND, BSL |
| | 108-20-3 | Isopropyl ether | < 0.006 (ND) | 0.014 (ND) | mg/kg | | 0 | 0.006-0.014 | 0.0140 | | NA | | | N | NSL |
| | 98-82-8 | Isopropylbenzene | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | NSL |
| | 74-88-4 | Methyl iodide | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | NSL |
| | 1634-04-4 | Methyl tert-butyl ether | < 0.00006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 47 C | | | N | AND, BSL |
| Soil | 75-09-2 | Methylene Chloride | 0.002 (J) | 0.002 (J) | mg/kg | SB01 | 2.5 | 0.0024-0.0056 | 0.0020 | | 35 N | | | N | BSL |
| | 104-51-8 | n-Butylbenzene | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 5.8 C | | | N | AND, BSL |
| | 103-65-1 | N-Propylbenzene | < 0.0012 (ND) | <0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 380 N | | | N | AND, BSL |
| | 135-98-8 | sec-Butylbenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 780 N | | | N | AND, BSL |
| | 100-42-5 | Styrene | < 0.0012 (ND) | < 0.028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 600 N | | | N | AND, BSL |
| | 98-06-6 | tert-Butylbenzene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 780 N | | | N | AND, BSL |
| | 127-18-4 | Tetrachloroethene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 8.1 N | | | N | AND, BSL |
| | 108-88-3 | Toluene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | 490 N | | | N | AND, BSL |
| | 156-60-5 | trans-1,2-Dichloroethene | < 0.0006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 160 N | | | N | AND, BSL |
| | 10061-02-6 | trans-1,3-Dichloropropene | < 0.0012 (ND) | < 0.0028 (ND) | mg/kg | | 0 | 0.0012-0.0028 | 0.0028 | | NA | | | N | NSL |
| | 79-01-6 | Trichloroethene | < 0.0006 (ND) | < 0.0014 (ND) | mg/kg | | 0 | 0.0006-0.0014 | 0.0014 | | 0.41 N | | | Y | KHC |
| | 75-69-4 | Trichlorofluoromethane | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 2,300 N | | | N | AND, BSL |
| | 108-05-4 | Vinyl acetate | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 91 N | | | N | AND, BSL |
| | 75-01-4 | Vinyl chloride | < 0.0024 (ND) | < 0.0056 (ND) | mg/kg | | 0 | 0.0024-0.0056 | 0.0056 | | 0.059 C | | | Y | KHC |
| | 1330-20-7 | Xylenes (total) | < 0.00075 (ND) | < 0.0018 (ND) | mg/kg | | 0 | 0.00075-0.0018 | 0.0018 | | 58 N | | | N | AND, BSL |
| | 90-12-0 | 1-Methylnaphthalene | 0.0003 (J) | 0.43 (J) | mg/kg | SB03 | 73 | 0.00048-0.00081 | 0.43 | | 18 C | | | N | BSL |
| | 91-57-6 | 2-Methylnaphthalene | 0.00043 (J) | 0.52 (J) | mg/kg | SB03 | 78 | 0.00064-0.00073 | 0.52 | | 24 N | | | N | BSL |

**RAGS Part D - Table 2 - Chemicals of Potential Concern (0 ft bgs to Water Table)**

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil (0 ft bgs to the Water Table - All Data)
Exposure Medium: Soil

| Exposure Point | CAS Number | Chemicals | Minimum Concentration (Qualifier) (1) | Maximum Concentration (Qualifier) (1) | Units | Location of Maximum Concentration | Detection Frequency (%) | Range of Detection Limits | Concentration Used for Screening (2) | Background Value (3) | Screening Toxicity Value (N/C) (4) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag (Y/N) | Rationale for Selection or Deletion (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil | 83-32-9 | Acenaphthene | 0.00033 (J) | 3.2 (J) | mg/kg | SB03 | 58 | 0.00026-0.00043 | 3.20 | | 360 N | | | N | BSL |
| | 208-96-8 | Acenaphthylene | 0.00019 (J) | 0.27 (J) | mg/kg | SB03 | 70 | 0.00064-0.0011 | 0.27 | | NA | | | N | NSL |
| | 120-12-7 | Anthracene | 0.0012 (J) | 7.2 (J) | mg/kg | SB03 | 58 | 0.0024-0.0041 | 7.2 | | 1,800 N | | | N | BSL |
| | 56-55-3 | Benzo[a]anthracene | 0.0012 (J) | 19 (J) | mg/kg | SB03 | 60 | 0.0024-0.0041 | 19.0 | | 1.1 C | | | Y | ASL |
| | 50-32-8 | Benzo[a]pyrene | 0.00082 (J) | 17 (J) | mg/kg | SB03 | 68 | 0.0024-0.0041 | 17.0 | | 0.11 C | | | Y | ASL |
| | 205-99-2 | Benzo[b]fluoranthene | 0.0013 (J) | 23 (J) | mg/kg | SB03 | 70 | 0.0024-0.0029 | 23.0 | | 1.1 C | | | Y | ASL |
| | 191-24-2 | Benzo[g,h,i]perylene | 0.0014 (J) | 9 (J) | mg/kg | SB03 | 60 | 0.0024-0.0041 | 9.0 | | NA | | | N | NSL |
| | 207-08-9 | Benzo[k]fluoranthene | 0.0021 (J) | 7.7 (J) | mg/kg | SB03 | 58 | 0.0024-0.0041 | 7.7 | | 11 C | | | N | BSL |
| | 218-01-9 | Chrysene | 0.0011 (J) | 23 (J) | mg/kg | SB03 | 73 | 0.0024-0.0029 | 23.0 | | 110 C | | | N | BSL |
| | 53-70-3 | Dibenz(a,h)anthracene | 0.001675 | 3 (J) | mg/kg | SB03 | 55 | 0.0024-0.0041 | 3.0 | | 0.11 C | | | Y | ASL |
| | 206-44-0 | Fluoranthene | 0.001 (J) | 42 (J) | mg/kg | SB03 | 78 | 0.0024-0.0028 | 42.0 | | 240 N | | | N | BSL |
| | 86-73-7 | Fluorene | 0.00071 (J) | 3 (J) | mg/kg | SB03 | 63 | 0.00064-0.0011 | 3.0 | | 240 N | | | N | BSL |
| | 193-39-5 | Indeno[1,2,3-cd]pyrene | 0.0035 (J) | 8.4 (J) | mg/kg | SB03 | 58 | 0.0024-0.0041 | 8.4 | | 1.1 C | | | Y | ASL |
| | 91-20-3 | Naphthalene | 0.00059 | 0.97 (J) | mg/kg | SB03 | 78 | 0.00064-0.00073 | 1.0 | | 3.8 C | | | N | BSL |
| | 85-01-8 | Phenanthrene | 0.0015 (J) | 30 (J) | mg/kg | SB03 | 70 | 0.0024-0.0029 | 30.0 | | NA | | | N | NSL |
| | 129-00-0 | Pyrene | 0.0011 (J) | 34 (J) | mg/kg | SB03 | 75 | 0.0024-0.0028 | 34.0 | | 180 N | | | N | BSL |
| | 72-54-8 | 4,4'-DDD | 0.00064 (J) | 0.0037 | mg/kg | SB10 | 12.5 | 0.0016-0.017 | 0.004 | | 0.19 N | | | N | BSL |
| | 72-55-9 | 4,4'-DDE | 0.00026 (J) | 0.041 (J) | mg/kg | SB04 | 30 | 0.00065-0.0068 | 0.041 | | 2 C | | | N | BSL |
| | 50-29-3 | 4,4'-DDT | 0.00076 (J) | 0.12 (J) | mg/kg | SB04 | 38 | 0.0016-0.019 | 0.120 | | 1.9 C | | | N | BSL |
| | 309-00-2 | Aldrin | 0.00053 (J) | 0.00057 (J) | mg/kg | SB07 | 5 | 0.00065-0.0068 | 0.0006 | | 0.039 C | | | N | BSL |
| | 319-84-6 | alpha-BHC | < 0.00065 (ND) | < 0.0068 (ND) | mg/kg | | 0 | 0.00065-0.0068 | 0.0068 | | 0.086 C | | | N | AND, BSL |
| | 5103-71-9 | alpha-Chlordane | 0.0017 (J) | 0.0017 (J) | mg/kg | SB08 | 2.5 | 0.00065-0.0068 | 0.0017 | | 1.7 C | | | N | BSL |
| | 319-85-7 | beta-BHC | < 0.0016 (ND) | < 0.017 (ND) | mg/kg | | 0 | 0.0016-0.017 | 0.017 | | 3 C | | | N | AND, BSL |
| | 319-86-8 | delta-BHC | < 0.00097 (ND) | < 0.01 (ND) | mg/kg | | 0 | 0.00097-0.01 | 0.0100 | | NA | | | N | NSL |
| | 60-57-1 | Dieldrin | 0.0007875 | 0.022 | mg/kg | SS07 | 20 | 0.00065-0.0068 | 0.0220 | | 0.034 C | | | N | BSL |
| | 959-98-8 | Endosulfan I | < 0.00065 (ND) | < (0.0068 (ND) | mg/kg | | 0 | 0.00065-0.0068 | 0.0068 | | 47 N | | | N | AND, BSL |
| | 33213-65-9 | Endosulfan II | < 0.00065 (ND) | < (0.0068 (ND) | mg/kg | | 0 | 0.00065-0.0068 | 0.0068 | | 47 N | | | N | AND, BSL |
| | 1031-07-8 | Endosulfan sulfate | 0.00034 | 0.00039(J) | mg/kg | SB04 | 5 | 0.00065-0.0068 | 0.0004 | | 38 N | | | N | BSL |
| | 72-20-8 | Endrin | < 0.00065 (ND) | < 0.0068 (ND) | mg/kg | | 0 | 0.00065-0.0068 | 0.0068 | | 1.9 N | | | N | AND, BSL |
| | 7421-93-4 | Endrin aldehyde | < 0.00065 (ND) | < 0.0068 (ND) | mg/kg | | 0 | 0.00065-0.0068 | 0.0068 | | NA | | | N | NSL |
| | 58-89-9 | gamma-BHC (Lindane) | < 0.00097 (ND) | < 0.01 (ND) | mg/kg | | 0 | 0.00097-0.01 | 0.0100 | | 0.57 C | | | N | AND, BSL |
| | 5103-74-2 | gamma-Chlordane | 0.00028 (J) | 0.013 (J) | mg/kg | SB03 | 17.5 | 0.00065-0.0011 | 0.0130 | | 1.7 C | | | N | BSL |
| | 76-44-8 | Heptachlor | < 0.00065 (ND) | < 0.0068 (ND) | mg/kg | | 0 | 0.00065-0.0068 | 0.0068 | | 0.13 C | | | N | AND, BSL |
| | 1024-57-3 | Heptachlor epoxide | < 0.00097 (ND) | < 0.01 (ND) | mg/kg | | 0 | 0.00097-0.01 | 0.01 | | 0.07 C | | | N | AND, BSL |
| | 72-43-5 | Methoxychlor | 0.026 (J) | 0.026 (J) | mg/kg | SB03 | 2.5 | 0.00097-0.012 | 0.026 | | 32 N | | | N | BSL |
| | 8001-35-2 | Toxaphene | < 0.032 (ND) | < 0.33 (ND) | mg/kg | | 0 | 0.032-0.33 | 0.33 | | 0.49 C | | | N | AND, BSL |
| | 12674-11-2 | Arochlor 1016 | < 0.015 (ND) | < 0.061 (ND) | mg/kg | | 0 | 0.015-0.061 | 0.0610 | | 0.4 N | | | N | AND, BSL |
| | 11104-28-2 | Arochlor 1221 | < 0.017 (ND) | < 0.069 (ND) | mg/kg | | 0 | 0.017-0.069 | 0.0690 | | 0.2 C | | | N | AND, BSL |

**RAGS Part D - Table 2 - Chemicals of Potential Concern (0 ft bgs to Water Table)**

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil (0 ft bgs to the Water Table - All Data)
Exposure Medium: Soil

| Exposure Point | CAS Number | Chemicals | Minimum Concentration (Qualifier) (1) | Maximum Concentration (Qualifier) (1) | Units | Location of Maximum Concentration | Detection Frequency (%) | Range of Detection Limits | Concentration Used for Screening (2) | Background Value (3) | Screening Toxicity Value (N/C) (4) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag (Y/N) | Rationale for Selection or Deletion (5) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11141-16-5 | Arochlor 1232 | < 0.015 (ND) | < 0.061 (ND) | mg/kg | | 0 | 0.015-0.061 | 0.0610 | | 0.17 C | | | N | AND, BSL |
| | 53469-21-9 | Arochlor 1242 | < 0.032 (ND) | < 0.13 (ND) | mg/kg | | 0 | 0.032-0.13 | 0.1300 | | 0.23 C | | | N | AND, BSL |
| | 12672-29-6 | Arochlor 1248 | < 0.019 (ND) | < 0.081 (ND) | mg/kg | | 0 | 0.019-0.081 | 0.0810 | | 0.23 C | | | N | AND, BSL |
| | 11097-69-1 | Arochlor 1254 | < 0.017 (ND) | < 0.069 (ND) | mg/kg | | 0 | 0.017-0.069 | 0.0690 | | 0.23 C | | | N | AND, BSL |
| | 11096-82-5 | Arochlor 1260 | 0.007575 | 0.66 | mg/kg | SB03 | 45 | 0.0075-0.012 | 0.660 | | 0.24 C | | | Y | ASL |
| | 7429-90-5 | Aluminum | 2,400 | 36,000 | mg/kg | SB04 | 100 | | 36,000 | | 7,700 N | | | Y | ASL |
| | 7440-36-0 | Antimony | < 1.1 (ND) | < 1.8 (ND) | mg/kg | | 0 | 1.1-1.8 | 1.8 | | 3.1 N | | | N | AND, BSL |
| | 7440-38-2 | Arsenic | 1.2 (J) | 8.3 | mg/kg | SB06 | 100 | | 8.3 | | 0.68 C | | | Y | ASL |
| | 7440-39-3 | Barium | 7.9 | 180 | mg/kg | SB04 | 100 | | 180 | | 1,500 N | | | N | BSL |
| | 7440-41-7 | Beryllium | 0.11 (J) | 0.86 | mg/kg | SB06 | 100 | | 0.860 | | 16 N | | | N | BSL |
| | 7440-43-9 | Cadmium | 0.036 (J) | 0.31 (J) | mg/kg | SS07 | 73 | 0.12-0.15 | 0.31 | | 7.1 N | | | N | BSL |
| | 7440-70-2 | Calcium | 480 | 34,000 | mg/kg | SS01 | 100 | | 34,000 | | NA | | | N | EN |
| | 16065-83-1 | Chromium (III) | 2.8 | 38 | mg/kg | SB04 | 100 | | 38 | | 12,000 N | | | N | BSL |
| | 18540-29-9 | Chromium (VI) | 2.8 | 38 | mg/kg | SB04 | 100 | | 38 | | 0.3 C | | | Y | ASL |
| Soil | 7440-48-4 | Cobalt | 1.9 | 11 | mg/kg | SB04/SB06 | 100 | | 11 | | 2.3 N | | | Y | ASL |
| | 7440-50-8 | Copper | 5.7 | 38 | mg/kg | SB05 | 100 | | 38 | | 310 N | | | N | BSL |
| | 7439-89-6 | Iron | 5,600 | 26,000 | mg/kg | SB05 | 100 | | 26,000 | | 5,500 N | | | Y | ASL |
| | 7439-92-1 | Lead | 1.2 | 21 | mg/kg | SS06 | 100 | | 21 | | 200 | | | N | BSL |
| | 7439-95-4 | Magnesium | 1,000 | 5,700 | mg/kg | SB06 | 100 | | 5,700 | | NA | | | N | EN |
| | 7439-96-5 | Manganese | 100 | 880 | mg/kg | SB05 | 100 | | 880 | | 180 N | | | Y | ASL |
| | 7439-97-6 | Mercury | 0.0071 (J) | 0.18 | mg/kg | SB04 | 80 | 0.015-0.017 | 0.18 | | 1.1 N | | | N | BSL |
| | 7440-02-0 | Nickel | 4.2 | 22 | mg/kg | SB04 | 100 | | 22.0 | | 150 N | | | N | BSL |
| | 7440-09-27 | Potassium | 370 | 2,100 | mg/kg | SB04 | 88 | 360-2,200 | 2,100 | | NA | | | N | EN |
| | 7782-49-2 | Selenium | 1.2 (J) | 1.2 (J) | mg/kg | SB04 | 3 | 2.2-3.3 | 1.2 | | 39 N | | | N | BSL |
| | 7440-22-4 | Silver | < 0.44 (ND) | < 0.71 (ND) | mg/kg | | 0 | 0.44-0.71 | 0.71 | | 39 N | | | N | BSL |
| | 7440-23-5 | Sodium | 58 (J) | 1,400 | mg/kg | SB04 | 90 | 320-580 | 1,400 | | NA | | | N | EN |
| | 7440-28-0 | Thallium | < 1.8 (ND) | < 3.0 (ND) | mg/kg | | 0 | 1.8-3 | 3.0 | | 0.078 N | | | N | AND, ASL |
| | 7440-62-2 | Vanadium | 4.5 | 48 | mg/kg | SB04 | 100 | | 48 | | 39 N | | | Y | ASL |
| | 7440-66-6 | Zinc | 11 | 110 | mg/kg | SS06 | 100 | | 110 | | 2,300 N | | | N | BSL |

Footnote Instructions:

(1) J: Estimated value that is below reporting limit and above method detection limit.

(2) Maximum detected concentration.

(3) This information is not included in the risk assessment. Background is addressed in the feasibility study (FS).

(4) Screening toxicity values, developed based on residential exposures. A target risk (TR) of 1×10-6 and/or a hazard quotient (HQ) of 0.1. Screening values were obtained from EPA regional screening level (RSL) tables (USEPA, April 2019).

(5) Define the codes used for the "Rationale for Selection or Deletion".

C: Carcinogenic N: Non-carcinogenic NA: Not Applicable

ASL: Above Screening Level AND: All non-detects BSL: Below Sceening Level

EN: Essential nutrient NSL: Screening level not available KHC: Known Human Carcinogen

ND: Chemical not detected

Note per the USEPA Superfund Technical Support Center's response dated March 16, 2018, the residential receptor screening toxicity value of 1.7 mg/kg for Chlordane, a surrogate chemical, was used as the screening toxicity value for alpha-chlordane and gamma-chlordane.

**Table 3.1 - RAGS Part D Tables (Calculation of Exposure Point Concnetrations)**

**Exposure Point Concentration (Soil depth 0 ft bgs to 2 ft bgs)**

**Reasonable Maximum Exposure**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York-**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil (0 to 2 ft bgs)

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) (1) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Soil at depths of 0 to 2 ft bgs | Aluminum | mg/kg | 5,422 | 6,058 (N) | 8,600 | 6,058 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Aroclor 1260 | mg/kg | 0.08 | 0.261 (NP) | 0.66 | 0.261 | mg/kg | Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1) | Recommended UCL from ProUCL |
| | Arsenic (inorganic) | mg/kg | 3.09 | 3.573 (N) | 5.4 | 3.573 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Benzene | mg/kg | 0.003 | Maximum | 0.003 | 0.003 | mg/kg | Maximum Concentration | Maximum Concentration |
| | Benzo[a]anthracene | mg/kg | 1.34 | 13.1 (NP) | 19 (J) | 13.1 | mg/kg | 99% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Benzo[a]pyrene | mg/kg | 1.20 | 11.72 (NP) | 17 (J) | 11.72 | mg/kg | 99% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Benzo[b]fluoranthene | mg/kg | 1.63 | 15.86 (NP) | 23 (J) | 15.86 | mg/kg | 99% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Chromium (VI) | mg/kg | 7.25 | 8.261 (N) | 12 | 8.261 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Cobalt | mg/kg | 3.87 | 4.517 (G) | 6 | 4.517 | mg/kg | 95% Adjusted Gamma UCL | Recommended UCL from ProUCL |
| | Dibenz(a,h)anthracene | mg/kg | 0.21 | 1.377 (NP) | 3 (J) | 1.377 | mg/kg | 97.5% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Indeno[1,2,3-cd]pyrene | mg/kg | 0.59 | 3.854 (NP) | 8.4 (J) | 3.854 | mg/kg | 97.5% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Iron | mg/kg | 11,275 | 12,917 (G) | 17,000 | 12,917 | mg/kg | 95% Adjusted Gamma UCL | Recommended UCL from ProUCL |
| | Manganese | mg/kg | 359 | 437.1 (N) | 880 | 437.1 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Trichlorethylene | mg/kg | 0.0014 | Maximum | 0.0014 | 0.0014 | mg/kg | Maximum Concentration | Maximum Concentration |
| | Vanadium | mg/kg | 10 | 11.62 (N) | 15 | 11.62 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Vinyl chloride | mg/kg | 0.0056 | Maximum | 0.0056 | 0.0056 | mg/kg | Maximum Concentration | Maximum Concentration |

Footnotes:

Average of duplicate samples was used to calculate the arithmetic mean, 95% UCL, and maximum concentrations.

J: Estimated value

mg/kg - milligrams/kilogram

UCL = Upper Confidence Limit

(1) Definition of the codes describing the type of distribution for the "95% UCL" term.

G: Gamma

N: Normal

NP: Non parametric

**Table 3.2 RAGS Part D Tables (Calculation of Exposure Point Concentration)**

**Exposure Point Concentration (0 ft bgs to Water Table)**

**Reasonable Maximum Exposure**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil (0 ft bgs to Water Table)

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) (1) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Soil from 0 ft bgs to Water Table | Aluminum | mg/kg | 6,580 | 7,459 (T) | 36,000 | 7,459 | mg/kg | 95% H-UCL | ProUCL recommendation |
| | Aroclor 1260 | mg/kg | 0.038 | 0.0955 (NP) | 0.66 | 0.096 | mg/kg | Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1) | ProUCL recommendation |
| | Arsenic (inorganic) | mg/kg | 2.93 | 3.314 (G) | 8.3 | 3.314 | mg/kg | 95% Adjusted Gamma UCL | ProUCL recommendation |
| | Benzene | mg/kg | 0.003 | Maximum | 0.003 | 0.003 | mg/kg | Maximum | Maximum |
| | Benzo[a]anthracene | mg/kg | 0.56 | 2.643 (NP) | 19 (J) | 2.643 | mg/kg | 95% KM (Chebyshev) UCL | ProUCL recommendation |
| | Benzo[a]pyrene | mg/kg | 0.50 | 3.161 (NP) | 17 (J) | 3.161 | mg/kg | 97.5% KM (Chebyshev) UCL | ProUCL recommendation |
| | Benzo[b]fluoranthene | mg/kg | 0.68 | 4.281 (NP) | 23 (J) | 4.281 | mg/kg | 97.5% KM (Chebyshev) UCL | ProUCL recommendation |
| | Chromium (VI) | mg/kg | 8.03 | 9.377 (T) | 38 | 9.377 | mg/kg | 95% H-UCL | ProUCL recommendation |
| | Cobalt | mg/kg | 4.06 | 4.662 (N) | 11 | 4.662 | mg/kg | 95% Student's-t UCL | ProUCL recommendation |
| | Dibenz(a,h)anthracene | mg/kg | 0.09 | 0.418 (NP) | 3 (J) | 0.418 | mg/kg | 95% KM (Chebyshev) UCL | ProUCL recommendation |
| | Indeno[1,2,3-cd]pyrene | mg/kg | 0.25 | 1.169 (NP) | 8.4 (J) | 1.169 | mg/kg | 95% KM (Chebyshev) UCL | ProUCL recommendation |
| | Iron | mg/kg | 11,677.5 | 13,175 (T) | 26,000 | 13,175 | mg/kg | 95% H-UCL | ProUCL recommendation |
| | Manganese | mg/kg | 298 | 343.6 (T) | 880 | 343.6 | mg/kg | 95% H-UCL | ProUCL recommendation |
| | Trichloroethylene | mg/kg | 0.0014 | Maximum | 0.0014 | 0.0014 | mg/kg | Maximum | Macimum |
| | Vanadium | mg/kg | 12 | 13.44 (G) | 48 | 13.44 | mg/kg | 95% Adjusted Gamma UCL | ProUCL recommendation |
| | Vinyl chloride | mg/kg | 0.0056 | Maximum | 0.0056 | 0.0056 | mg/kg | Maximum | Maximum |

Footnote Instructions:

Average of duplicate samples was used to calculate the arithmetic mean, 95% UCL, and maximum concentrations.

J: Estimated value

(1) Definition of the codes describing the type of distribution for the "95% UCL" term.

G: Gamma

N: Normal

NP: Non parametric (distribution free)

T: Transformed (lognormal)

**Table 3.2 - Appendix 1**

**Physical Chemical Properties for Chemicals of Potential Concern**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

| COPC | CAS No. | Dimensionless Henry's Law Constant (H`) (unitless) | Dimensional Henry's Law Constant (H) (atm-$m^3$/mole) | H' and H Source | Vapor Pressure (VP) mm Hg | VP Source | Diffusivity in Air ($D_{ia}$) ($cm^2$/s) | Diffusivity in Water $D_{iw}$ ($cm^2$/s) | $D_{ia}$ and $D_{iw}$ Source | Soil Water Partition Coefficient ($K_d$) (L/kg) | $K_d$ Source | Organic Carbon Adsorption Coefficient ($K_{oc}$) (L/kg) | $K_{oc}$ Source | Is COPC Volatile? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | | | | | | | | |
| Benz[a]anthracene | 56-55-3 | 4.9E-04 | 1.2E-05 | SRC 2013 | 2.1E-07 | SRC 2013 | 2.6E-02 | 6.7E-06 | USEPA 2001 | NA | N/A | 1.8E+05 | USEPA 2012 | **Yes** |
| Benzo[a]pyrene | 50-32-8 | 1.9E-05 | 4.6E-07 | SRC 2013 | 5.5E-09 | USEPA 2012 | 4.8E-02 | 5.6E-06 | USEPA 2001 | NA | N/A | 5.9E+05 | USEPA 2012 | No |
| Benzo[b]fluoranthene | 205-99-2 | 2.7E-05 | 6.6E-07 | SRC 2013 | 5.0E-07 | SRC 2013 | 4.8E-02 | 5.6E-06 | USEPA 2001 | NA | N/A | 6.0E+05 | USEPA 2012 | No |
| Dibenz[a,h]anthracene | 53-70-3 | 5.8E-06 | 1.4E-07 | USEPA 2012 | 9.6E-10 | USEPA 2012 | 4.5E-02 | 5.2E-06 | USEPA 2001 | NA | N/A | 1.9E+06 | USEPA 2012 | No |
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1.4E-05 | 3.5E-07 | SRC 2013 | 1.3E-10 | SRC 2013 | 4.5E-02 | 5.2E-06 | USEPA 2001 | NA | N/A | 2.0E+06 | USEPA 2012 | No |
| **Poly Chlorinated Biphenyls (PCBs)** | | | | | | | | | | | | | | |
| Aroclor 1260 | 11096-82-5 | 1.4E-02 | 3.4E-04 | SRC 2013 | 4.1E-05 | SRC 2013 | 2.2E-02 | 5.6E-06 | USEPA 2001 | NA | N/A | 3.5E+05 | USEPA 2012 | **Yes** |
| **Metals** | | | | | | | | | | | | | | |
| Aluminum | 7429-90-5 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 1.5E+03 | Baes 1984 | NA | N/A | No |
| Arsenic | 7440-38-2 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 2.9E+01 | USEPA 2002 | NA | N/A | No |
| Chromium (VI) | 18540-29-9 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 1.9E+01 | USEPA 2002 | NA | N/A | No |
| Cobalt | 7440-48-4 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 4.5E+01 | Baes 1984 | NA | N/A | No |
| Iron | 7439-89-6 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 2.5E+01 | Baes 1984 | NA | N/A | No |
| Manganese | 7439-96-5 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 6.5E+01 | Baes 1984 | NA | N/A | No |
| Vanadium | 7440-62-2 | NA | NA | N/A | NA | N/A | NA | NA | N/A | 1.0E+03 | USEPA 2002 | NA | N/A | No |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | 71-43-2 | 2.3E-01 | 5.6E-03 | SRC 2013 | 9.5E+01 | SRC 2013 | 9.0E-02 | 1.0E-05 | USEPA 2001 | NA | N/A | 1.5E+02 | USEPA 2012 | **Yes** |
| Trichlorethylene | 79-01-6 | 4.0E-01 | 9.9E-03 | SRC 2013 | 6.9E+01 | SRC 2013 | 6.9E-02 | 1.0E-05 | USEPA 2001 | NA | N/A | 6.1E+01 | USEPA 2012 | **Yes** |
| Vinyl Chloride | 75-01-4 | 1.1E+00 | 2.8E-02 | SRC 2013 | 3.0E+03 | USEPA 2012 | 1.1E-01 | 1.2E-05 | USEPA 2001 | NA | N/A | 2.2E+01 | USEPA 2012 | **Yes** |

COPC: Chemical of Potential Concern. NA: Not available. N/A: Not applicable

Baes, C.F. 1984. Oak Ridge National Laboratory. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Values are also found in Superfund Chemical Data Matrix (SCDM).

SRC 2013. Syracuse Research Corporation (SRC) Physical Properties Database.

USEPA 2001. WATER9. Version 1.0.0. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

USEPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

USEPA 2012. Estimation Programs Interface (EPI) Suite. November 2012

Per USEPA (November 2017), a chemical is considered volatile if its dimensional Henry's Law Constant is greater than or equal to $1\times10^{-5}$ atm-$m^3$/mole or vapor pressure greater than or equal to 1 mm Hg.

**Table 4.1(a)**

**Values Used for Daily Intake Calculations for Soil Ingestion Pathway for Non-Carcinogenic Chemicals - Future Resident (0 to 2 ft bgs and 0 ft bgs to Water Table)**

**Reasonable Maximum Exposure Parameters for Ingestion**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil depths of 0 to 2 ft bgs and 0 ft bgs to Water Table

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion of soil | Resident (Two Depths - 0 to 2 ft bgs and 0 ft bgs to Water Table) | Child | Soils at depths from 0 to 2 ft bgs and from 0 ft bgs to Water Table | $Intake_{c\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{C-soil-ing} = \frac{EPC \times EF_c \times ED_c \times IRS_c \times RBA}{BW_c \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific value from Tables 3.1 & 3.2 | mg/kg | RAGS Tables 3.1 & 3.2. | |
| | | | | $EF_c$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_c$ | Exposure duration | 6 | year | USEPA, 1991 | |
| | | | | $IRS_c$ | Soil ingestion rate | 200 | mg/day | USEPA, 1991 | |
| | | | | $BW_c$ | Body weight | 15 | kg | USEPA, 1991 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | USEPA 1989 | $Intake_{C-soil-ing} = \frac{EPC \times EF_c \times ED_c \times IRS_c \times RBA}{BW_c \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 6 | year | Equal to ED | |
| | | | | RBA | Relative bioavailability | Chemicl Specific | % | USEPA, 2012 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Adult | | $Intake_{a\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Value | mg/kg-day | Calculated | $Intake_{a-soil-ing} = \frac{EPC \times EF_a \times ED_a \times IRS_a \times RBA}{BW_a \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific value from Tables 3.1 & 3.2 | mg/kg | RAGS Tables 3.1 & 3.2. | |
| | | | | $EF_a$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_a$ | Exposure duration | 20 | year | USEPA, 2014 | |
| | | | | $IRS_a$ | Soil ingestion rate | 100 | mg/day | USEPA, 1991 | |
| | | | | $BW_a$ | Body weight | 80 | kg | USEPA, 2011 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | USEPA, 1989 | $Intake_{a-soil-ing} = \frac{EPC \times EF_a \times ED_a \times IRS_a \times RBA}{BW_a \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 20 | year | Equal to ED | |
| | | | | RBA | Relative bioavailability | Chemicl Specific | % | USEPA, 2012 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Age-adjusted for carcinogens | | $Intake_{aa\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Value | mg/kg-day | Calculated | $Intake_{a-soil-ing} = \frac{EPC \times IRS_{aa} \times RBA}{AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific value from Tables 3.1 & 3.2 | mg/kg | RAGS Tables 3.1 & 3.2. | |
| | | | | $IRS_{aa}$ | Ingestion rate | 36,750 | mg-soil/ kg-body weight | Calculated | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | 1989 | $IRS_{aa} = \frac{ED_c \times EF_c \times IRS_c}{BW_c} + \frac{ED_a \times EF_a \times IRS_a}{BW_a}$ |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | | | Note parameters not defined here are available above. | | | | | |

Footnote Instructions:

NA: Not applicable


USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2011. Exposure Factors Handbook 2011 Edition (Final).

USEPA, 2012. OSWER Directive 9200.1-113, Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil.

USEPA, 2014. OSWER Directive 9200.1-120, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors

**Table 4.1(b)**

**Values Used for Daily Intake Calculations for Dermal Contact with Soil Pathway for Non-Carcinogenic Chemicals - Future Resident (0 to 2 ft bgs to Water Table)**

**Reasonable Maximum Exposure Assumptions for Dermal Contact**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil from 0 bgs to 2 ft bgs and 0 ft bgs to Water Table

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal contact with soil | Resident (Two soil depths) | Child | Scenario 1: soil from 0 to 2 ft bgs and Scenario 2: soil from 0 ft bgs to Water Table | $Intake_{c\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{C-soil-dc} = \frac{EPC \times EF_c \times ED_c \times SA_c \times AF_c \times ABS_d}{BW_c \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific values from Tables 3.1 & 3.2 | mg/kg | RAGS Tables 3.1 & 3.2 | |
| | | | | $EF_c$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_c$ | Exposure duration | 6 | year | USEPA, 1991 | |
| | | | | $SA_c$ | Skin surface area for contact with soil | 2,373 | $cm^2$/day | USEPA, 2011 | |
| | | | | $AF_c$ | Soil to skin adherence factor | 0.2 | $mg/cm^2$ | USEPA, 2002 | $Intake_{c-soil-dc} = \frac{EPC \times EF_c \times ED_c \times SA_c \times AF_c \times ABS_d}{BW_c \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | |
| | | | | $BW_c$ | Body weight | 15 | kg | USEPA, 1991 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 6 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Adult | | $Intake_{a\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{a-soil-dc} = \frac{EPC \times EF_a \times ED_a \times SA_a \times AF_a \times ABS_d}{BW_a \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific values from Tables 3.1 & 3.2 | mg/kg | RAGS Tables 3.1 & 3.2 | |
| | | | | $EF_a$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_a$ | Exposure duration | 20 | year | USEPA, 1991 | |
| | | | | $SA_a$ | Skin surface area for contact with soil | 6,032 | $cm^2$/day | USEPA, 2011 | |
| | | | | $AF_a$ | Soil to skin adherence factor | 0.07 | $mg/cm^2$ | USEPA, 2002 | $Intake_{a-soil-dc} = \frac{EPC \times EF_a \times ED_a \times SA_a \times AF_a \times ABS_d}{BW_a \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | |
| | | | | $BW_a$ | Body weight | 80 | kg | USEPA, 1991 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 20 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Age-adjusted | | $Intake_{aa\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{aa\text{-}soil\text{-}dc} = \frac{EPC \times DF_{aa} \times ABS_d}{AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific values from Tables 3.1 & 3.2 | mg/kg | RAGS Tables 3.1 & 3.2 | |
| | | | | $DF_{aa}$ | Dermal factor | 103,390 | mg-soil/ kg-body weight | Calculated | |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA, 1989 | $DF_{aa} = \frac{ED_c \times EF_c \times SA_c \times AF_c}{BW_c} + \frac{ED_a \times EF_a \times SA_a \times AF_a}{BW_a}$ |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | | | Note parameters not defined here are available above. | | | | | |

Footnote Instructions:


USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

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

USEPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP. July 2004

USEPA 2011. Exposure Factors Handbook 2011 Edition (Final).

**Table 4.1 (c)**
**Values Used for Vapor Inhalation Pathway Calculations for Non-Carcinogenic Chemicals - Future Resident (0 to 2 ft bgs and 0 ft bgs to Water Table)**
**Reasonable Maximum Exposure for Air Exposures**
**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Ambient air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation of vapors and particulates | Resident (Dpths 0 to 2 ft bgs and 0 ft bgs to Water Table) | Child | Breathing zone | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | $EC = \frac{CA \times ET_{oc} \times ED_c \times EF_c}{AT_c \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | RAGS Tables 3.1 & 3.2 | |
| | | | | $ET_{oc}$ | Exposure time | 24 | hours/day | USEPA, 2014 | |
| | | | | $ED_c$ | Exposure duration | 6 | year | USEPA, 1991 | $EC = \frac{CA \times ET_{oc} \times ED_c \times EF_c}{AT_{nc} \times 365 \times 24}$ |
| | | | | $EF_c$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 6 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging Time - carcinogens | 70 | years | USEPA 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $CA = CS \times VF_{ss}$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for air emissions | Chemical specific | $kg\text{-}soil/m^3\text{-}air$ | Calculated | |
| | | Adult | | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | $EC = \frac{CA \times ET_{oa} \times ED_a \times EF_a}{AT_c \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | RAGS Tables 3.1 & 3.2 | |
| | | | | $ET_{oa}$ | Outdoor exposure time | 24 | hours/day | USEPA, 2014 | |
| | | | | $ED_a$ | Exposure duration | 20 | year | USEPA, 2014 | $EC = \frac{CA \times ET_{oa} \times ED_a \times EF_a}{AT_{nc} \times 365 \times 24}$ |
| | | | | $EF_a$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 20 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging Time - carcinogens | 70 | years | USEPA 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $CA = CS \times VF_{ss}$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for air emissions | Chemical specific | $kg\text{-}soil/m^3\text{-}air$ | Calculated | |
| | | Age-adjusted | | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | $EC = \frac{CA \times ET_{oaa} \times ED_{aa} \times EF_{aa}}{AT_{nc} \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | RAGS Tables 3.1 & 3.2 | |
| | | | | $ET_{oaa}$ | Exposure time | 24 | hours/day | USEPA, 2014 | |
| | | | | $ED_{aa}$ | Exposure duration | 26 | year | USEPA, 2011 | $CA = CS \times VF_{ss}$ |
| | | | | $EF_{aa}$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | Equal to Lifetime | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $ED_{aa} = ED_c + ED_a$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for surface soils | Chemical specific | $kg\text{-}soil/m^3\text{-}air$ | Calculated | |
| | | | | Note parameters not defined here are available above. | | | | | |

Footnote Instructions:

USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2011. Exposure Factors Handbook 2011 Edition (Final).

NA= Not applicable.

USEPA, 2014. OSWER Directive 9200.1-120, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors

**Table 4.2**

**Values Used for Vapor Inhalation Pathway Calculations for Chemicals - Future Resident (0 to 2 ft bgs and 0 ft bgs to Water Table)**

**Reasonable Maximum Exposure - Air Exposures from Volatile Chemicals**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Ambient air (Volatiles)

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Volatilization factor for air emissions from soil to outdoor air | | | | $VF_{ss-i}$ | Surface soils volatilization factor for infinite sources | Chemical specific | kg-soil/$m^3$-air | Calculated | $VF_{ss-i} = \left[ Q/C \times \frac{(3.14 \times D_A \times \tau)^{1/2}}{(2 \times \rho_s \times D_A)} \times 10^{-4} \right]^{-1}$ |
| | | | | $VF_{ss-m}$ | Surface soils volatilization factor for finite (mass limit) sources | Chemical specific | kg-soil/$m^3$-air | Calculated | $VF_{ss-m} = \left[ Q/C \times \frac{\tau}{\rho_s \times d_s \times 10000} \right]^{-1}$ |
| | | | | Q/C | Inverse of the mean concentration at the center of square source | 62.55 | (g/$m^2$-s)/(kg/$m^3$) | USEPA, 1996 | |
| | | | | $D_A$ | Apparent diffusivity | Calculated | $cm^2$/s | Calculated | $D_A = \frac{\left(\theta_{as}^{10/3} \times D^a \times H + \theta_{ws}^{10/3} \times D^w\right) / \theta_T^2}{\rho_s \times K_{oc} \times f_{oc} + \theta_{ws} + \theta_{as} \times H}$ |
| | | | | $\tau$ | Averaging time for vapor flux | | | | |
| | | | | | Child | 1.89E+08 | seconds | Calculated | |
| | | | | | Adult | 6.31E+08 | seconds | Calculated | |
| | | | | | Age-adjusted | 8.20E+08 | seconds | Calculated | |
| | | | | $\rho_s$ | Dry Soil Bulk Density in the Vadose Zone | 1.62 | g/$cm^3$ | USEPA, 2004 | |
| | | | | H | Dimension less Herny's law constant | Chemical specific | unitless | SRC, 2013; USEPA, 2012 | |
| | | | | $K_{oc}$ | Organic carbon adsorption coefficient | Chemical specific | L/kg | SRC, 2013 | |
| | | | | $D^a$ | Diffusivity in air | Chemical specific | $cm^2$/s | USEPA, 2001 | |
| | | | | $D^w$ | Diffusivity in water | Chemical specific | $cm^2$/s | USEPA, 2001 | |
| | | | | $f_{oc}$ | Fractional Organic Carbon Content in the Vadose Zone | 0.002 | g-C/g-soil | Professional Judgement | |
| | | | | $\theta_T$ | Total Soil Porosity in the Vadose Zone | 0.39 | cc/cc | Professional Judgement | |
| | | | | $\theta_{ws}$ | Volumetric Water Content in the Vadose Zone | 0.049 | cc/cc | Professional Judgement | |
| | | | | $\theta_{as}$ | Volumetric Air Content in the Vadose Zone | 0.341 | cc/cc | Calculated | Minimum of the two volatilization factors is used. |
| | | | | $d_s$ | Lower Depth of Surficial Soil Zone | | | | |
| | | | | | Scenario 1 | 60.96 | cm | Site-specific | |
| | | | | | Scenario 2 | 237.74 | cm | Site-specific | |

Footnote Instructions:


USEPA, 1996. Soil Screening Guidance: User's Guide.

USEPA, 2001. WATER9. Version 1.0.0. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

USEPA, 2004. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings. February 2004.

USEPA, 2012. Estimation Programs Interface (EPI) Suite. November 2012


NA: Not applicable


SRC, 2013. Syracuse Research Corporation (SRC) Physical Properties Database.

USEPA, 2014. OSWER Directive 9200.1-120, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors

**Table 4.3**

**Values Used for Particulates Inhalation Pathway Calculations for Chemicals - Future Resident (0 to 2 ft bgs and 0 ft bgs to Water Table)**

**Reasonable Maximum Exposure**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Ambient air Particulates

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name (1) |
|---|---|---|---|---|---|---|---|---|---|
| Volatilization factor for particulate emissions from surficial soil to outdoor air | | | | $VF_p$ | Volatilization factor for particulate emissions | Chemical specific | kg-soil/$m^3$-air | Calculated | $VF_p = \left[ Q/C \times \frac{3600}{0.036 \times (1-V) \times \left(U_m/U_t\right)^3 \times F(x)} \right]^{-1}$ |
| | | | | Q/C | Inverse of the mean concentration at the center of square source | 62.55 | ($g/m^2$-s)/($kg/m^3$) | USEPA, 1996 | |
| | | | | V | Fraction of Vegetative Cover | 0.5 | $m^2/m^2$ | USEPA, 2019 | |
| | | | | $U_m$ | Mean Annual Wind Speed | 2.68 | m/s | NOAA, 1998 | |
| | | | | $U_t$ | Equivalent Threshold Value of Windspeed | 11.32 | m/s | USEPA, 1996 | |
| | | | | $F_{(x)}$ | Windspeed Distribution Function from Cowherd et. al, 1985 | 0.194 | unitless | USEPA, 2002 | |
| | | | | 0.036 | Empirical constant | 0.036 | $g/m^2$-hr | USEPA, 2017 | |

Footnote Instructions:

USEPA, 1996. Soil Screening Guidance: User's Guide. NA: Not applicable

NOAA, 1998. Climatic and Wind Data for the United States, National Oceanic and Atmospheric Administration.

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

USEPA, 2014. OSWER Directive 9200.1-120, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors

**Table 4.4(a)**

**Values Used for Daily Intake Calculations for Soil Ingestion Pathway for Carcinogenic and Non-Carcinogenic Chemicals - Construction Worker (0 ft bgs to Water Table)**

**Reasonable Maximum Exposure Parameters for Ingestion**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil depth of 0 ft bgs to Water Table

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion of soil | Construction Worker | Adult | Soil from 0 ft bgs to Water Table | $Intake_{c\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Value | mg/kg-day | Calculated | $Intake_{Cw-soil-ing} = \frac{EPC \times EF_{cw} \times ED_{cw} \times IRS_{cw} \times RBA}{BW_{cw} \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value | mg/kg | Table 3.2. | |
| | | | | $EF_{cw}$ | Exposure frequency | 30 | days/year | Professional judgment | |
| | | | | $ED_{cw}$ | Exposure duration | 1 | year | USEPA, 2002 | |
| | | | | $IRS_{cw}$ | Soil ingestion rate | 330 | mg/day | USEPA, 2002 | $Intake_{Cw-soil-ing} = \frac{EPC \times EF_{cw} \times ED_{cw} \times IRS_{cw} \times RBA}{BW_{cw} \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $BW_{cw}$ | Body weight | 80 | kg | USEPA, 2011 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | USEPA 1989 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 1 | year | Equal to ED | |
| | | | | RBA | Relative bioavailability | Chemicl Specific | % | USEPA, 2012 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |

Footnote Instructions:

NA: Not applicable

USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

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

USEPA, 2011. Exposure Factors Handbook 2011 Edition (Final). National Center for Environmental Assessment, Office of Research and Development. Washington D.C.

**Table 4.4(b)**

**Values Used for Daily Intake Calculations for Dermal Contact with Soil Pathway for Carcinogenic and Non-Carcinogenic Chemicals - Construction Worker (0 ft bgs to water table)**

**Reasonable Maximum Exposure Assumptions for Dermal Contact**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil from 0 ft bgs to Water Table

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal contact with soil | Construction Worker | Adult | Soil from 0 ft bgs to water table | $Intake_{c\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated chemical specific Values | mg/kg-day | Calculated | $Intake_{Cw-soil-dc} = \frac{EPC \times EF_{cw} \times ED_{cw} \times SA_{cw} \times AF_{cw} \times ABS_d}{BW_{cw} \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific value from Table 3.2 | mg/kg | Table 3.2 | |
| | | | | $EF_{cw}$ | Exposure frequency | 30 | days/year | Professional judgment | |
| | | | | $ED_{cw}$ | Exposure duration | 1 | year | USEPA, 2002 | |
| | | | | $SA_{cw}$ | Skin surface area for contact with soil | 3,527 | $cm^2$/day | USEPA, 2011 | |
| | | | | $AF_{cw}$ | Soil to skin adherence factor | 0.3 | $mg/cm^2$ | USEPA, 2002 | |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | |
| | | | | $BW_{cw}$ | Body weight | 80 | kg | USEPA, 2011 | $Intake_{Cw-soil-dc} = \frac{EPC \times EF_{cw} \times ED_{cw} \times SA_{cw} \times AF_{cw} \times ABS_d}{BW_{cw} \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 1 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |

Footnote Instructions:

USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

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

USEPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP. July 2004

USEPA 2011. Exposure Factors Handbook 2011 Edition (Final).

**Table 4.4(c)**

**Values Used for Vapor Inhalation Pathway Calculations for Carcinogenic and Non-Carcinogenic Chemicals - Construction Worker (0 ft bgs to Water Table)**

**Reasonable Maximum Exposure - Air Exposures**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Ambient air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation of vapors and particulates | Construction Worker | Adult | Breathing zone | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | $EC = \frac{CA \times ET_{ocw} \times ED_{cw} \times EF_{cw}}{AT_c \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | $mg/m^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | RAGS Table 3.2 | $EC = \frac{CA \times ET_{ocw} \times ED_{cw} \times EF_{cw}}{AT_{nc} \times 365 \times 24}$ |
| | | | | $ET_{ocw}$ | Exposure time | 8 | hours/day | USEPA, 2017 | |
| | | | | $ED_{cw}$ | Exposure duration | 1 | year | USEPA, 2002 | |
| | | | | $EF_{cw}$ | Exposure frequency | 30 | days/year | Professional Judgment | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 1 | year | Equal to ED | $CA = CS \times VF_{ss}$ |
| | | | | $AT_c$ | Averaging Time - carcinogens | 70 | years | USEPA 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $CA = CS \times VF_p$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for air emissions | Chemical specific | $kg\text{-}soil/m^3\text{-}air$ | Calculated | |
| | | | | $VF_p$ | Volatilization factor for particulate emissions | Chemical specific | $kg\text{-}soil/m^3\text{-}air$ | Calculated | |

Footnote Instructions:

USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

NA= Not applicable.

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

USEPA, 2017. Regional Screening Level User Guide

**Table 5.1 - Risk Assessment Guidance for Superfund Part D Tables**

**Chronic Non-Cancer Toxicity Data - Oral and Dermal**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD | | Oral Absorption Efficiency for Dermal (1) | Absorbed RfD for Dermal | | Dermal Absorption Fraction ($ABS_d$) | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfD: Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | | Value | Units | | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | | | | | |
| Benzo[a]anthracene | NA | NA | N/A | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| Benzo[a]pyrene | Chronic | 3.0E-04 | mg/kg-day | 1 | 3.0E-04 | mg/kg-day | 0.13 | Nervous System (Developmental toxicity) | 300 | IRIS | 1/19/2017 |
| Benzo[b]fluoranthene | NA | NA | N/A | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | NA | NA | N/A | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| Indeno[1,2,3-cd]pyrene | NA | NA | N/A | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | | | | | |
| Aroclor 1260 (RfD for Aroclor 1254 used as surrogate) | Chronic | 2.0E-05 | mg/kg-day | 1 | NA | mg/kg-day | 0.14 | Immune System (Ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails; decreased antibody (IgG and IgM) response to sheep erythrocytes). Based on oral RfD for Aroclor 1254. | 300 | IRIS | 10/1/1994 |
| **Metals** | | | | | | | | | | | |
| Aluminum | Chronic | 1.0E+00 | mg/kg-day | 1 | 1.0E+00 | mg/kg-day | 1 | Neurological (Nervous system and morphological developmental) | 100 | PPRTV | 10/23/2006 |
| Arsenic (inorganic) | Chronic | 3.0E-04 | mg/kg-day | 1 | 3.0E-04 | mg/kg-day | 0.03 | Skin and blood vessels (hyperpigmentaiton, keratosis and possible vascular complications) | 3/1 | IRIS | 2/10/1988 |
| Chromium (VI) | Chronic | 3.0E-03 | mg/kg-day | 0.025 | 7.5E-05 | mg/kg-day | NA | Gastrointestinal tract | 300/3 | IRIS | 9/3/1998 |
| Cobalt | Chronic | 3.0E-04 | mg/kg-day | 1 | 3.0E-04 | mg/kg-day | NA | Thyroid (decreased iodine uptake) | 300 | PPRTV | 8/25/2008 |
| Iron | Chronic | 7.0E-01 | mg/kg-day | 1 | 7.0E-01 | mg/kg-day | NA | Gastrointestinal tract (adverse gastrointestinal effects) | 1.5 | PPRTV | 9/11/2006 |
| Manganese (non-diet) | Chronic | 2.4E-02 | mg/kg-day | 0.04 | 9.6E-04 | mg/kg-day | NA | Central nervous system | 1/1 (additional MF of 3 to account for non-dietary exposure) | IRIS | 11/1/1995 |
| Vanadium (RfD for Vanadium pentoxide) | Chronic | 9.0E-03 | mg/kg-day | 0.026 | 2.3E-04 | mg/kg-day | NA | Decreased hair cystine | 100/1 | IRIS | 6/30/1988 |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| Benzene | Chronic | 4.0E-03 | mg/kg-day | 1.000 | 4.0E-03 | mg/kg-day | NA | Immune (decreased lymphocyte count) | 300/1 | IRIS | 4/17/2003 |
| Trichlorethylene | Chronic | 5.0E-04 | mg/kg-day | 1.000 | 5.0E-04 | mg/kg-day | NA | Developmental (Increased fetal cardiac malformations in Sprague-Dawley rats) | 10/1 | IRIS | 9/28/2011 |
| Vinyl Chloride | Chronic | 3.0E-03 | mg/kg-day | 1.000 | 3.0E-03 | mg/kg-day | NA | Hepatic (Liver cell polymorphisms) | 30/1 | IRIS | 8/7/2000 |

Footnote Instructions:

(1): Oral Absorption Efficiency Factor Obtained from USEPA Risk Assessment Guidance Part E (USEPA, November 2004). Refer to Section 4.0 of the risk assessment text for the derivation of the "Oral Absorption Efficiency for Dermal". The Dermal Guidance recommends not adjusting toxicity values with absorption factors of 50% or less (see Section 4.2).

N/A: Not applicable.

NA: Toxicity values meeting the Toxicity Hierarchy is not available.

IRIS: Integrated Risk Information System

PPRTV: Provisional Peer Reviewed Toxicity Values.

**Table 5.2 - Risk Assessment Guidance for Superfund Part D Tables**

**Chronic Non-Cancer Toxicity Data - Inhalation**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

| Chemical of Potential Concern | Chronic/ Subchronic | Inhalation RfC | | Extrapolated RfD | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfC : Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | | | |
| Benzo[a]anthracene | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Benzo[a]pyrene | Chronic | 2.0E-06 | $mg/m^3$ | N/A | N/A | Developmental toxicity (Decreasd embryo/fetal survival) | 3,000 | IRIS | January 2017 |
| Benzo[b]fluoranthene | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Indeno[1,2,3-cd]pyrene | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | | | |
| Arochlor 1260 | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| **Metals** | | | | | | | | | |
| Aluminum | Chronic | 5.0E-03 | $mg/m^3$ | N/A | N/A | Neurological (Brain psychomotor and cognitive impairment effects) | 300 | PPRTV | 10/23/2006 |
| Arsenic | Chronic | 1.5E-05 | $mg/m^3$ | N/A | N/A | Reproductive/ development; cardiovascular system; nervous system; lung; skin | NA | CalEPA | 7/1/2014 |
| Chromium (VI) | Chronic | 1.0E-04 | $mg/m^3$ | N/A | N/A | Respiratory system (lactate dehydrogenase in bronchioalveolar lavage fluid) | 300/1 | IRIS | 9/3/1998 |
| Cobalt | Chronic | 6.0E-06 | $mg/m^3$ | N/A | N/A | Respiratory tract and lung (decreased function) | 300 | PPRTV | 8/25/2008 |
| Iron | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Manganese (non-diet) | Chronic | 5.0E-05 | $mg/m^3$ | N/A | N/A | Nervous system (impairment of neurogehavioral function) | 1000/1 | IRIS | 12/1/1003 |
| Vanadium | Chronic | 1.0E-04 | $mg/m^3$ | N/A | N/A | Respiratory (Epiglottis Respiratory Epithelium) | 30 | ATSDR | 9/1/2012 |
| **Volatile Organic Compounds** | | | | | | | | | |
| Benzene | Chronic | 0.03 | mg/m3 | NA | NA | Immune System (decreased lymphocyte count) | 300 | IRIS | 4.17.2003 |
| Trichloroethylene | Chronic | 2.0E-03 | mg/m3 | NA | NA | Immune System (decreased thymus weight in B6C3F1 mice) | 100 | IRIS | 9/28/2011 |
| Vinyl Chloride | Chronic | 1.0E-01 | mg/m3 | NA | NA | (Hepatic) Liver cell polymorphism) | 30 | IRIS | 8/7/2000 |

Footnote Instructions:

Note that the inhalation hazard quotient (HQ) will be calculated using concentration based "Inhalation RfC". Therefore, dose based "Extrapolated RfD" is not required.

NA: Value not available in RSL. IRIS: Integrated Risk Information System PPRTV: Provisional Peer Reviewed Toxicity Values

ATSDR: Agency for toxic substances and disease registry CalEPA: California Environmental Protection Agency N/A: Not applicable

**Table 5.3 - Risk Assessment Guidance for Superfund Part D**

**Subchronic Non-Cancer Toxicity Data - Oral and Dermal**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD | | Oral Absorption Efficiency for Dermal | Absorbed RfD for Dermal | | Dermal Absorption Fraction ($ABS_d$) | Primary Target Organ(s) | Combined Uncertainty/ Modifying Factors | RfD:Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | (1) | Value | Units | | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | | | | | |
| Benzo[a]anthracene | NA | NA | mg/kg-day | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| Benzo[a]pyrene | NA | NA | mg/kg-day | NA | NA | mg/kg-day | NA | NA | NA | NA | NA |
| Benzo[b]fluoranthene | NA | NA | mg/kg-day | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | NA | NA | mg/kg-day | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| Indeno[1,2,3-cd]pyrene | NA | NA | mg/kg-day | 1 | NA | mg/kg-day | 0.13 | NA | NA | NA | NA |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | | | | | |
| Aroclor 1260 | Subchronic | 3.0E-05 | mg/kg-day | 1 | NA | mg/kg-day | NA | Immune System (Based on subchronic RfD for Aroclor 1254). | 300 | ATSDR | 11/1/2000 |
| **Metals** | | | | | | | | | | | |
| Aluminum | Subchronic | 1E+00 | mg/kg-day | 1 | 1E+00 | mg/kg-day | N/A | Neurological (impaired performance on the water maze test in males) | 100/0.3 | ATSDR | 9/1/2008 |
| Arsenic (inorganic) * | Subchronic | NA | mg/kg-day | NA | NA | mg/kg-day | NA | NA | NA | NA | NA |
| Chromium (VI) | Subchronic | 5.0E-03 | mg/kg-day | 0.025 | 1.3E-04 | mg/kg-day | NA | Hematological (Microcytic, hypochromic, anemia) | 300/1 | ATSDR | 8/25/2008 |
| Cobalt | Subchronic | 3.0E-03 | mg/kg-day | 1 | 3.0E-03 | mg/kg-day | NA | Thyroid (decreased iodine uptake) | 300 | PPRTV | 8/25/2008 |
| Iron | Subchronic | 7.0E-01 | mg/kg-day | 1 | 7.0E-01 | mg/kg-day | NA | Gastrointestinal tract (adverse gastrointestinal effects) | 1.5 | PPRTV | 9/11/2006 |
| Manganese (non-diet) | Subchronic | NA | mg/kg-day | NA | NA | mg/kg-day | NA | NA | NA | NA | NA |
| Vanadium | Subchronic | 7.0E-04 | mg/kg-day | 0.026 | 1.8E-05 | mg/kg-day | NA | Kidney (histopathology) | 300/1 | PPRTV | 9/30/2009 |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| Benzene | Subchronic | 1.0E-02 | mg/kg-day | NA | 4.0E-03 | mg/kg-day | NA | Immune (decreased lymphocyte count) | 100/1 | PPRTV | 9/29/2009 |
| Trichlorethylene | Subchronic | NA | mg/kg-day | NA | NA | mg/kg-day | NA | NA | NA | NA | NA |
| Vinyl Chloride | Subchronic | NA | mg/kg-day | NA | NA | mg/kg-day | NA | NA | NA | NA | NA |

Footnote Instructions:

(1): Oral Absorption Efficiency Factor Obtained from USEPA Risk Assessment Guidance Part E (USEPA, November 2004). Refer to Section 4.0 of the risk assessment text for the derivation of the "Oral Absorption Efficiency for Dermal". The Dermal Guidance recommends not adjusting toxicity values with absorption factors of 50% or less (see Section 5.3).

N/A: Not applicable.

NA: Toxicity values meeting the Toxicity Hierarchy is not available.

IRIS: Integrated Risk Information System

PPRTV: Provisional Peer Reviewewed Toxicity Values.

* Value available from the PPRTV Archive but this document is not available for review and the toxicity values were not used in this human health risk assessment.

**Table 5.4 - Risk Assessment Guidance for Superfund Part D Tables**

**Subchronic Non-Cancer Toxicity Data - Inhalation**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

| Chemical of Potential Concern | Chronic/ **Subchronic** | Inhalation RfC | | Extrapolated RfD | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfC : Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | | | |
| Benzo[a]anthracene | Subchronic | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Benzo[a]pyrene | Subchronic | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Benzo[b]fluoranthene | Subchronic | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | Subchronic | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Indeno[1,2,3-cd]pyrene | Subchronic | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | | | |
| Arochlor 1260 | Subchronic | NA | mg/m3 | N/A | N/A | NA | NA | NA | NA |
| **Metals** | | | | | | | | | |
| Aluminum | Subchronic | NA | $mg/m^3$ | N/A | N/A | NA | NA | NA | NA |
| Arsenic | Subchronic | NA | $mg/m^3$ | N/A | N/A | NA | NA | NA | NA |
| Chromium (VI) | Subchronic | 3.0E-04 | $mg/m^3$ | N/A | N/A | Respiratory (Increased lung weight, hyperplasia, macrophase infilitration, increased protein, albumin, lactate dehydrogenase in BAL fluid) | 30 | ATSDR | 6/1/2012 |
| Cobalt | Subchronic | 2.0E-05 | $mg/m^3$ | N/A | N/A | Respiratory (irritation, decreased lung function) | 100 | PPRTV | 8/25/2008 |
| Iron | NA | NA | N/A | N/A | N/A | NA | NA | NA | NA |
| Manganese (non-diet) | Subchronic | NA | $mg/m^3$ | N/A | N/A | NA | 1000/1 | IRIS | 12/1/1003 |
| Vanadium | Subchronic | N/A | $mg/m^3$ | N/A | N/A | N/A | N/A | N/A | N/A |
| **Volatile Organic Compounds** | | | | | | | | | |
| Benzene | Subchronic | 0.08 | mg/m3 | N/A | N/A | Immune System (Decreased lymphocyte count) | 100 | PPRTV | 9/29/2009 |
| Trichloroethylene | Subchronic | NA | mg/m3 | NA | NA | NA | NA | NA | NA |
| Vinyl Chloride | Subchronic | 8E-02 | mg/m3 | NA | NA | Hepatic System (Centrilobular hypertrophy) | 3E+01 | ATSDR | 7/1/2006 |

Footnote Instructions:

Note that the inhalation hazard quotient (HQ) will be calculated using concentration based "Inhalation RfC". Therefore, dose based "Extrapolated RfD" is not required.

NA: Value not available in RSL. IRIS: Integrated Risk Information System PPRTV: Provisional Peer Reviewed Toxicity Values

ATSDR: Agency for toxic substances and disease registry N/A: Not applicable

**Table 6.1 - Risk Assessment Guidance for Superfund Part D Tables**

**Cancer Toxicity Data - Oral and Dermal**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

| Chemical of Potential Concern | Oral Cancer Slope Factor | | Oral Absorption Efficiency for Dermal | Absorbed Cancer Slope Factor for Dermal | | Dermal Absorption Fraction ($ABS_d$) | Weight of Evidence/ Cancer Guideline Description | Oral CSF | |
|---|---|---|---|---|---|---|---|---|---|
| | Value | Units | (1) | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | | | |
| Benzo[a]anthracene | 1.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 1 | 1.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 0.13 | B2-Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans | USEPA Relative Potency Factor for PAHs based on Benzo-a-pyrene*. | 07/1993 |
| Benzo[a]pyrene | 1.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 1 | 1.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 0.13 | A-Human carcinogen | IRIS | 01/19/2017 |
| Benzo[b]fluoranthene | 1.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 1 | 1.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 0.13 | B2-Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans | USEPA Relative Potency Factor for PAHs based on Benzo-a-pyrene*. | 07/1993 |
| Dibenz(a,h)anthracene | 1.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 1 | 1.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 0.13 | B2-Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans | USEPA Relative Potency Factor for PAHs based on Benzo-a-pyrene*. | 07/1993 |
| Indeno[1,2,3-cd]pyrene | 1.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 1 | 1.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 0.13 | B2-Probable human carcinogen indicates sufficient evidence in animals and no evidence in humans | USEPA Relative Potency Factor for PAHs based on Benzo-a-pyrene*. | 07/1993 |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | | | |
| Aroclor 1260 | 2.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 1 | 2.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 0.14 | B2- Probable Human Carcinogen indicating sufficient data in animals and suggestive evidence in humans (based on USEPA, 1996 - Cancer Reassessment of PCBs). | IRIS chemical file based on USEPA. PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures (1996). USEPA, Office of Research and Development, National Center for Environmental Assessment, Washington Office, Washington, DC, EPA/600/P-96/001F, 1996. | 1996 |
| **Metals** | | | | | | | | | |
| Aluminum | NA | N/A | NA | NA | N/A | 1 | Chemical not evaluated for carcinogenicity by USEPA. | IRIS | 2018 |
| Arsenic | 1.5E+00 | $(mg/kg\text{-}day)^{-1}$ | 1 | 1.5E+00 | $(mg/kg\text{-}day)^{-1}$ | 0.03 | A-Human carcinogen | IRIS | 06/01/1995 |
| Chromium (VI) | 5.0E-01 | $(mg/kg\text{-}day)^{-1}$ | 0.025 | 2.0E+01 | $(mg/kg\text{-}day)^{-1}$ | NA | See discussion in Public Health Goals for Chemicals in Drinking Water regarding carcinogenicity. | CalEPA | 03/03/2011 |
| Cobalt | NA | N/A | NA | NA | N/A | NA | NA | NA | NA |
| Iron | NA | N/A | NA | NA | N/A | NA | Class D. Not classified. | NA | 09/07/1988 |
| Manganese | NA | N/A | NA | NA | N/A | NA | Class D. Not classifiable as to carcinogenicity. | IRIS | 9/26/1988 |
| Vanadium | NA | N/A | NA | NA | N/A | NA | Not classified as to carcinogenicity | PPRTV | 9/30/2009 |
| **Volatile Organic Compounds** | | | | | | | | | |
| Benzene | 5.50E-02 | $(mg/kg\text{-}day)^{-1}$ | 1 | NA | N/A | NA | Known human carcinogen | IRIS | 4/17/2003 |
| Trichloroethylene | 4.60E-02 | $(mg/kg\text{-}day)^{-1}$ | 1 | NA | N/A | NA | Known human carcinogen | IRIS | 9/28/2011 |
| Vinyl Chloride | 7.20E-01 | $(mg/kg\text{-}day)^{-1}$ | 1 | NA | N/A | NA | Known human carcinogen | IRIS | 8/7/2000 |

Footnote Instructions:

Refer to Section 4.0 of the risk assessment text for the derivation of the "Absorbed Cancer Slope Factor for Dermal".

(1): Oral Absorption Efficiency for Dermal was obtained EPA's Regional Screening Level (RSL) summary tables (USEPA, April 2019)

CalEPA: California Environmental Protection Agency IRIS: Integrated Risk Information System

N/A: Not applicable

* USEPA 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EAP/600/R-93/089.

**Table 6.2 - Risk Assessment Guidance for Superfund Part D Tables**

**Cancer Toxicity Data - Inhalation**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

| Chemical of Potential Concern | Unit Risk | | Inhalation Cancer Slope Factor | | Weight of Evidence/ Cancer Guideline Description | Unit Risk: Inhalation CSF | |
|---|---|---|---|---|---|---|---|
| | Value | Units | Value | Units | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | | | | |
| Benzo[a]anthracene | 6.0E-05 | $(\mu g/m^3)^{-1}$ | N/A | N/A | B2-Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans | USEPA Relative Potency Factors for PAHs* | 07/1993 |
| Benzo[a]pyrene | 6.0E-04 | $(\mu g/m^3)^{-1}$ | N/A | N/A | A-Human carcinogen | IRIS | 01/19/2017 |
| Benzo[b]fluoranthene | 6.0E-05 | $(\mu g/m^3)^{-1}$ | N/A | N/A | B2-Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans | USEPA Relative Potency Factors for PAHs* | 07/1993 |
| Dibenz(a,h)anthracene | 6.0E-04 | $(\mu g/m^3)^{-1}$ | N/A | N/A | B2-Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans | USEPA Relative Potency Factors for PAHs* | 07/1993 |
| Indeno[1,2,3-cd]pyrene | 6.0E-05 | $(\mu g/m^3)^{-1}$ | N/A | N/A | B2-Probable human carcinogen indicates sufficient evidence in animals and no evidence in humans | USEPA Relative Potency Factors for PAHs* | 07/1993 |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | |
| Arochlor 1260 | 5.7E-04 | $(\mu g/m^3)^{-1}$ | N/A | N/A | B2-Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals and suggestive evidence in humans. | IRIS | 1996 |
| **Metals** | | | | | | | |
| Aluminum | NA | N/A | N/A | N/A | NA | NA | NA |
| Arsenic | 4.3E-03 | $(\mu g/m^3)^{-1}$ | N/A | N/A | A- Known human carcinogen | IRIS | 2/10/1988 |
| Chromium (VI) | 8.4E-02 | $(\mu g/m^3)^{-1}$ | N/A | N/A | A-Known human carcinogen | USEPA RSL | 4/1/2019 |
| Cobalt | 9.0E-03 | $(\mu g/m^3)^{-1}$ | N/A | N/A | "likely to be carcinogenic to humans by the inhalation route," | PPRTV | 8/25/2008 |
| Iron | NA | N/A | N/A | N/A | Inadequate Evidence Not Classifiable | PPRTV | 7/29/2005 |
| Manganese | NA | N/A | N/A | N/A | Not classifiable as to carcinogenicity | IRIS | 9/26/1988 |
| Vanadium | NA | N/A | N/A | N/A | Not evaluated as to carcinogenicity. | PPRTV | 9/30/2009 |
| **Volatile Organic Compounds** | | | | | | | |
| Benzene | 7.8E-06 | $(\mu g/m^3)^{-1}$ | N/A | N/A | A- Known human carcinogen | IRIS | 3/1/1988 |
| Trichlorethylene | 4.1E-06 | $(\mu g/m^3)^{-1}$ | N/A | N/A | A- Known human carcinogen | IRIS | 9/28/2011 |
| Vinyl Chloride | 4.4E-06 | $(\mu g/m^3)^{-1}$ | N/A | N/A | A- Known human carcinogen | IRIS | 8/7/2000 |

Footnote Instructions:

Note that the inhalation risk will be calculated using concentration based "Unit Risk". Therefore, dose based "Inhalation Cancer slope Factor" is not required.

NA: Value not available in RSL. IRIS: Integrated Risk Information System PPRTV: Provisional Peer Reviewed Toxicity Values

USEPA RSL: USEPA Regional Screening Levels (see Section 5 regarding chromium VI N/A: Not applicable

**Table 7.1(a) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Adult - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Future Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 bgs to 2 Feet bgs)
Receptor Age: Adult/Child (cancer) and Non-cancer- Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations -Adult | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Ingestion | Aluminum | 6,058 | mg/kg | 0.00871 | mg/kg-day | - | - | - | 0.0072613 | mg/kg-day | 1 | mg/kg-day | 0.01 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.000000375 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 0.000000751 | 3.12842E-07 | mg/kg-day | 2.00E-05 | mg/kg-day | 0.0 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.00000308 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 4.63E-06 | 2.56962E-06 | mg/kg-day | 0.0003 | mg/kg-day | 0.01 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 0.0000855 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 8.55E-06 | 5.3387E-06 | mg/kg-day | - | mg/kg-day | - |
| | | | | Benzene | 0.003 | mg/kg | 4.32E-09 | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | 2.37E-10 | 1.07877E-08 | mg/kg-day | 0.004 | mg/kg-day | 0.00000 |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.0000765 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 7.65E-05 | 1.40479E-05 | mg/kg-day | 0.0003 | mg/kg-day | 0.04683 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.000104 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 1.04E-05 | 1.90103E-05 | mg/kg-day | - | mg/kg-day | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.0000539 | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | 2.70E-05 | 9.90188E-06 | mg/kg-day | 0.003 | mg/kg-day | 0.00330 |
| | | | | Cobalt | 4.517 | mg/kg | 0.0000065 | mg/kg-day | - | - | - | 5.41421E-06 | mg/kg-day | 0.0003 | mg/kg-day | 0.01805 |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.00000899 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 8.99E-06 | 1.65051E-06 | mg/kg-day | - | mg/kg-day | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.0000252 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.52E-06 | 4.61952E-06 | mg/kg-day | - | mg/kg-day | - |
| | | | | Iron | 12,917 | mg/kg | 0.0186 | mg/kg-day | - | - | - | 0.015482705 | mg/kg-day | 0.7 | mg/kg-day | 0.02212 |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.000629 | mg/kg-day | - | - | - | 0.000523921 | mg/kg-day | 0.024 | mg/kg-day | 0.02183 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 3.47E-09 | mg/kg-day | 0.046 | $(mg/kg\text{-}day)^{-1}$ | 1.59E-10 | 1.67808E-09 | mg/kg-day | 0.0005 | mg/kg-day | 0.00000 |
| | | | | Vanadium | 11.62 | mg/kg | 0.0000167 | mg/kg-day | - | - | - | 1.39281E-05 | mg/kg-day | 0.00504 | mg/kg-day | 0.00276 |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 8.27E-08 | mg/kg-day | 0.72 | $(mg/kg\text{-}day)^{-1}$ | 5.96E-08 | 6.71233E-09 | mg/kg-day | 0.003 | mg/kg-day | 0.00000 |
| | | | Exp. Route Total | | | | | | | | 1.4E-04 | | | | | 1.46E-01 |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Dermal | Aluminum | 6,058 | mg/kg | - | - | - | - | - | - | - | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.000000148 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 0.000000296 | 3.12842E-07 | mg/kg-day | 2.00E-05 | mg/kg-day | 0.02 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.000000434 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 0.000000651 | 5.43904E-07 | mg/kg-day | 0.0003 | mg/kg-day | 0.01 |
| | | | | Benzene | 13.1 | mg/kg | 0.0000285 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.85E-06 | 0.006630036 | mg/kg-day | - | - | - |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | - | - | 0.055 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.004 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.0000255 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 2.55E-05 | 7.02397E-06 | mg/kg-day | 0.0003 | mg/kg-day | 0.023 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.0000346 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 3.46E-06 | 9.50514E-06 | mg/kg-day | - | - | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | - | - | 0.5 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.003 | mg/kg-day | - |
| | | | | Cobalt | 4.517 | mg/kg | - | - | - | - | - | - | - | 0.0003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.000003 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 3.00E-06 | 8.25257E-07 | mg/kg-day | - | - | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.0000084 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 0.00000084 | 2.30976E-06 | mg/kg-day | - | - | - |
| | | | | Iron | 12917 | mg/kg | - | - | - | - | - | - | - | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | - | - | - | - | - | - | - | 0.024 | mg/kg-day | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | - | 0.046 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 11.62 | mg/kg | - | - | - | - | - | - | - | 0.00504 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | - | 0.72 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.003 | mg/kg-day | - |
| | | | Exp. Route Total | | | | | | | | 3.7E-05 | | | | | 0.05 |

**Table 7.1(a) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Adult - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Future Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 bgs to 2 Feet bgs)
Receptor Age: Adult/Child (cancer) and Non-cancer- Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations -Adult | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 6,058 | mg/kg | 0.00159 | $\mu g/m^3$ | - | | - | 4.2714E-06 | $mg/m^3$ | 0.005 | $mg/m^3$ | 0.0009 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.0000708 | $\mu g/m^3$ | 0.000571 | $(\mu g/m^3)$-1 | 4.05E-08 | 1.8402E-10 | $mg/m^3$ | - | - | - |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.000000936 | $\mu g/m^3$ | 0.0043 | $(\mu g/m^3)$-1 | 4.03E-09 | 2.5192E-09 | $mg/m^3$ | 0.000015 | $mg/m^3$ | 0.0002 |
| | | | | Benzene | 13.1 | mg/kg | 0.00294 | $\mu g/m^3$ | 0.00006 | $(\mu g/m^3)$-1 | 0.000000176 | 0.00298967 | $mg/m^3$ | - | - | - |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.000302 | $\mu g/m^3$ | 0.0000078 | $(\mu g/m^3)$-1 | 2.36E-09 | 6.5678E-10 | $mg/m^3$ | - | - | - |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.0000085 | $\mu g/m^3$ | 0.0006 | $(\mu g/m^3)$-1 | 5.1E-09 | 8.2635E-09 | $mg/m^3$ | 0.000002 | $mg/m^3$ | 0.0041 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.0000115 | $\mu g/m^3$ | 0.00006 | $(\mu g/m^3)$-1 | 6.9E-10 | 1.1183E-08 | $mg/m^3$ | - | - | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.00000599 | $\mu g/m^3$ | 0.084 | $(\mu g/m^3)$-1 | 0.000000503 | 5.8246E-09 | $mg/m^3$ | 0.0001 | $mg/m^3$ | 0.0001 |
| | | | | Cobalt | 4.517 | mg/kg | 0.00000118 | $\mu g/m^3$ | 0.009 | $(\mu g/m^3)$-1 | 1.07E-08 | 3.1848E-09 | $mg/m^3$ | 0.000006 | $mg/m^3$ | 0.0005 |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.000000999 | $\mu g/m^3$ | 0.0006 | $(\mu g/m^3)$-1 | 5.99E-10 | 9.7089E-10 | $mg/m^3$ | - | - | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.0000028 | $\mu g/m^3$ | 0.00006 | $(\mu g/m^3)$-1 | 1.68E-10 | 2.7174E-09 | $mg/m^3$ | - | - | - |
| | | | | Iron | 12,917 | mg/kg | 0.00338 | $\mu g/m^3$ | - | | - | 9.1075E-06 | $mg/m^3$ | - | - | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.000115 | $\mu g/m^3$ | - | | - | 3.0819E-07 | $mg/m^3$ | 0.00005 | $mg/m^3$ | 0.0062 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.000323 | $\mu g/m^3$ | 0.0000041 | $(\mu g/m^3)$-1 | 1.33E-09 | 6.0679E-07 | $mg/m^3$ | 0.002 | $mg/m^3$ | 0.0003 |
| | | | | Vanadium | 11.62 | mg/kg | 0.00000304 | $\mu g/m^3$ | - | | - | 8.193E-09 | $mg/m^3$ | - | - | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.00795 | $\mu g/m^3$ | 0.0000044 | $(\mu g/m^3)$-1 | 0.000000035 | 3.94843E-12 | $mg/m^3$ | 0.1 | $mg/m^3$ | 0.00000000004 |
| | | | Exp. Route Total | | | | | | | | 7.79E-07 | | | | | 0.01 |
| | | Exposure Point Total | | | | | | | | | 1.8E-04 | | | | | 0.208 |
| Exposure Medium Total | | | | | | | | | | | 1.8E-04 | | | | | 0.208 |
| Medium Total | | | | | | | | | | | 1.8E-04 | | | | | 0.208 |
| | | | | | | | | | Total of Receptor Risks Across All Media | | 1.8E-04 | | | Total of Receptor Hazards Across All Media | | 0.21 |

**Table 7.1(b) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Future Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 bgs to 2 Feet bgs)
Receptor Age: Adult/Child (cancer) and Non-cancer- Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Ingestion | Aluminum | 6,058 | mg/kg | 0.00871 | mg/kg-day | - | | - | 0.0775 | mg/kg-day | 1 | mg/kg-day | 0.08 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.000000375 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 0.000000751 | 0.00000334 | mg/kg-day | 2.00E-05 | mg/kg-day | 0.2 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.00000308 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 4.63E-06 | 0.0000274 | mg/kg-day | 0.0003 | mg/kg-day | 0.09 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 0.0000855 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 8.55E-06 | 0.000167 | mg/kg-day | - | | - |
| | | | | Benzene | 0.003 | mg/kg | 4.32E-09 | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | 2.37E-10 | 3.84E-08 | mg/kg-day | 0.004 | mg/kg-day | 0.00001 |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.0000765 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 7.65E-05 | 0.00015 | mg/kg-day | 0.0003 | mg/kg-day | **0.5** |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.000104 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 1.04E-05 | 0.000203 | mg/kg-day | - | mg/kg-day | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.0000539 | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | 2.70E-05 | 0.000106 | mg/kg-day | 0.003 | mg/kg-day | 0.04 |
| | | | | Cobalt | 4.517 | mg/kg | 0.0000065 | mg/kg-day | - | | - | 0.0000578 | mg/kg-day | 0.0003 | mg/kg-day | **0.2** |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.00000899 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 8.99E-06 | 0.0000176 | mg/kg-day | - | mg/kg-day | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.0000252 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.52E-06 | 0.0000493 | mg/kg-day | - | mg/kg-day | - |
| | | | | Iron | 12,917 | mg/kg | 0.0186 | mg/kg-day | - | | - | 0.165 | mg/kg-day | 0.7 | mg/kg-day | **0.2** |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.000629 | mg/kg-day | - | | - | 0.00559 | mg/kg-day | 0.024 | mg/kg-day | **0.2** |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 3.47E-09 | mg/kg-day | 0.046 | $(mg/kg\text{-}day)^{-1}$ | 1.59E-10 | 1.79E-08 | mg/kg-day | 0.0005 | mg/kg-day | 0.00004 |
| | | | | Vanadium | 11.62 | mg/kg | 0.0000167 | mg/kg-day | - | | - | 0.000149 | mg/kg-day | 0.00504 | mg/kg-day | 0.03 |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 8.27E-08 | mg/kg-day | 0.72 | $(mg/kg\text{-}day)^{-1}$ | 5.96E-08 | 7.16E-08 | mg/kg-day | 0.003 | mg/kg-day | 0.00002 |
| | | | Exp. Route Total | | | | | | | | 1.4E-04 | | | | | 1.6E+00 |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Dermal | Aluminum | 6,058 | mg/kg | - | | - | | - | - | | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.000000148 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 0.000000296 | 0.00000111 | mg/kg-day | 2.00E-05 | mg/kg-day | 0.06 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.000000434 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 0.000000651 | 0.00000325 | mg/kg-day | 0.0003 | mg/kg-day | 0.01 |
| | | | | Benzene | 13.1 | mg/kg | 0.0000285 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.85E-06 | 0.0000517 | mg/kg-day | - | | - |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | - | | 0.055 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.004 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.0000255 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 2.55E-05 | 0.0000462 | mg/kg-day | 0.0003 | mg/kg-day | 0.2 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.0000346 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 3.46E-06 | 0.0000626 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | - | | 0.5 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.003 | mg/kg-day | - |
| | | | | Cobalt | 4.517 | mg/kg | - | | - | | - | - | | 0.0003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.000003 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **3.00E-06** | 0.00000543 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.0000084 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 0.00000084 | 0.0000152 | mg/kg-day | - | | - |
| | | | | Iron | 12917 | mg/kg | - | | - | | - | - | | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | - | | - | | - | - | | 0.024 | mg/kg-day | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | | 0.046 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 11.62 | mg/kg | - | | - | | - | - | | 0.00504 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | | 0.72 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.003 | mg/kg-day | - |
| | | | Exp. Route Total | | | | | | | | 3.7E-05 | | | | | 0.2 |

**Table 7.1(b) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Future Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 bgs to 2 Feet bgs)
Receptor Age: Adult/Child (cancer) and Non-cancer- Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 6,058 | mg/kg | 0.00159 | µg/m$^3$ | - | | - | 0.00000427 | mg/m$^3$ | 0.005 | mg/m$^3$ | 0.0009 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.0000708 | µg/m$^3$ | 0.000571 | (µg/m$^3$)-1 | 4.05E-08 | 0.000000191 | mg/m$^3$ | - | | - |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.000000936 | µg/m$^3$ | 0.0043 | (µg/m$^3$)-1 | 4.03E-09 | 2.52E-09 | mg/m$^3$ | 0.000015 | mg/m$^3$ | 0.0002 |
| | | | | Benzene | 13.1 | mg/kg | 0.00294 | µg/m$^3$ | 0.00006 | (µg/m$^3$)-1 | 0.000000176 | 0.00000286 | mg/m$^3$ | - | | - |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.000302 | µg/m$^3$ | 0.0000078 | (µg/m$^3$)-1 | 2.36E-09 | 0.000000814 | mg/m$^3$ | - | | - |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.0000085 | µg/m$^3$ | 0.0006 | (µg/m$^3$)-1 | 5.1E-09 | 8.27E-09 | mg/m$^3$ | 0.000002 | mg/m$^3$ | 0.004 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.0000115 | µg/m$^3$ | 0.00006 | (µg/m$^3$)-1 | 6.9E-10 | 1.12E-08 | mg/m$^3$ | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.00000599 | µg/m$^3$ | 0.084 | (µg/m$^3$)-1 | 0.000000503 | 5.83E-09 | mg/m$^3$ | 0.0001 | mg/m$^3$ | 0.00006 |
| | | | | Cobalt | 4.517 | mg/kg | 0.00000118 | µg/m$^3$ | 0.009 | (µg/m$^3$)-1 | 1.07E-08 | 3.19E-09 | mg/m$^3$ | 0.000006 | mg/m$^3$ | 0.0005 |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.000000999 | µg/m$^3$ | 0.0006 | (µg/m$^3$)-1 | 5.99E-10 | 9.71E-10 | mg/m$^3$ | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.0000028 | µg/m$^3$ | 0.00006 | (µg/m$^3$)-1 | 1.68E-10 | 2.72E-09 | mg/m$^3$ | - | | - |
| | | | | Iron | 12,917 | mg/kg | 0.00338 | µg/m$^3$ | - | | - | 0.00000911 | mg/m$^3$ | - | | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.000115 | µg/m$^3$ | - | | - | 0.000000308 | mg/m$^3$ | 0.00005 | mg/m$^3$ | 0.006 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.000323 | µg/m$^3$ | 0.0000041 | (µg/m$^3$)-1 | 1.33E-09 | 0.000000608 | mg/m$^3$ | 0.002 | mg/m$^3$ | 0.0003 |
| | | | | Vanadium | 11.62 | mg/kg | 0.00000304 | µg/m$^3$ | - | | - | 8.2E-09 | mg/m$^3$ | - | | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.00795 | µg/m$^3$ | 0.0000044 | (µg/m$^3$)-1 | 0.000000035 | 0.00000562 | mg/m$^3$ | 0.1 | mg/m$^3$ | 0.00006 |
| | | | Exp. Route Total | | | | | | | | 7.79E-07 | | | | | 0.01 |
| | | Exposure Point Total | | | | | | | | | 1.8E-04 | | | | | 1.8 |
| | Exposure Medium Total | | | | | | | | | | 1.8E-04 | | | | | 1.8 |
| Medium Total | | | | | | | | | | | 1.8E-04 | | | | | 1.8 |
| | | | | | | | | | | | Total of Receptor Risks Across All Media 1.8E-04 | | | | | Total of Receptor Hazards Across All Media 1.8 |

**Table 7.2(a) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Table (Adult/Child Resident -Cancer and Adult Non-cancer)**

**Reasonable Maximum Exposure (RME) - Child Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 ft bgs to Water Table
Receptor Age: Adult/Child (cancer) and Non-cancer- Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to Water Table | Ingestion | Aluminum | 7,459 | mg/kg | 0.0107 | mg/kg-day | - | - | - | 0.008940582 | mg/kg-day | 1 | mg/kg-day | 8.94E-03 |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 0.000000138 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 2.76E-07 | 1.15068E-07 | mg/kg-day | 2.00E-05 | mg/kg-day | 5.75E-03 |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 0.00000286 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 4.29E-06 | 2.38336E-06 | mg/kg-day | 0.0003 | mg/kg-day | 7.94E-03 |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.0000173 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 1.73E-06 | 1.2226E-09 | mg/kg-day | - | mg/kg-day | - |
| | | | | Benzene | 2.643 | mg/kg | 4.32E-09 | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | 2.37E-10 | 9.50394E-06 | mg/kg-day | 0.004 | mg/kg-day | 2.38E-03 |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 0.0000206 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 2.06E-05 | 3.78887E-06 | mg/kg-day | 0.0003 | mg/kg-day | 1.26E-02 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 0.000028 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.80E-06 | 5.13134E-06 | mg/kg-day | - | mg/kg-day | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | 0.0000612 | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | 3.06E-05 | 1.12396E-05 | mg/kg-day | 0.003 | mg/kg-day | 3.75E-03 |
| | | | | Cobalt | 4.662 | mg/kg | 0.00000671 | mg/kg-day | - | - | - | 5.58801E-06 | mg/kg-day | 0.0003 | mg/kg-day | 1.86E-02 |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 0.00000273 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 2.73E-06 | 5.01027E-07 | mg/kg-day | - | mg/kg-day | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 0.00000763 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 7.63E-07 | 1.4012E-06 | mg/kg-day | - | mg/kg-day | - |
| | | | | Iron | 13,175 | mg/kg | 0.019 | mg/kg-day | - | - | - | 0.015791952 | mg/kg-day | 0.7 | mg/kg-day | 2.26E-02 |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | 0.000494 | mg/kg-day | - | - | - | 0.000411849 | mg/kg-day | 0.024 | mg/kg-day | 1.72E-02 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 3.47E-09 | mg/kg-day | 0.046 | $(mg/kg\text{-}day)^{-1}$ | 1.59E-10 | 1.67808E-09 | mg/kg-day | 0.0005 | mg/kg-day | 3.36E-06 |
| | | | | Vanadium | 13.44 | mg/kg | 0.0000193 | mg/kg-day | - | - | - | 1.61096E-05 | mg/kg-day | 0.00504 | mg/kg-day | 3.20E-03 |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 8.27E-08 | mg/kg-day | 0.72 | $(mg/kg\text{-}day)^{-1}$ | 5.96E-08 | 6.71233E-09 | mg/kg-day | 0.003 | mg/kg-day | 2.24E-06 |
| | | | Exp. Route Total | | | | | | | | 6.4E-05 | | | | | 1.0E-01 |
| Soil | Soil | Soil 0 ft bgs to Water Table | Dermal | Aluminum | 7,459 | mg/kg | - | - | - | - | - | - | - | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 5.44E-08 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 1.09E-07 | 1.15068E-07 | mg/kg-day | 2.00E-05 | mg/kg-day | 5.75E-03 |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 0.000000402 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 6.03E-07 | 5.04477E-07 | mg/kg-day | 0.0003 | mg/kg-day | 0.00 |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.00000576 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 5.76E-07 | 1.51833E-06 | mg/kg-day | - | - | - |
| | | | | Benzene | 2.643 | mg/kg | - | - | 0.055 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.004 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 0.00000689 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 6.89E-06 | 1.89443E-06 | mg/kg-day | 0.0003 | mg/kg-day | 0.01 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 0.00000933 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 9.33E-07 | 2.56567E-06 | mg/kg-day | - | - | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | - | - | 0.5 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.003 | mg/kg-day | - |
| | | | | Cobalt | 4.662 | mg/kg | - | - | - | - | - | - | - | 0.0003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 0.000000911 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 9.11E-07 | 2.50514E-07 | mg/kg-day | - | - | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 0.00000255 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.55E-07 | 7.00599E-07 | mg/kg-day | - | - | - |
| | | | | Iron | 13,175 | mg/kg | - | - | - | - | - | - | - | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | - | - | - | - | - | - | - | 0.024 | mg/kg-day | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | - | 0.046 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 13.44 | mg/kg | - | - | - | - | - | - | - | 0.00504 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | - | 0.72 | $(mg/kg\text{-}day)^{-1}$ | - | - | - | 0.003 | mg/kg-day | - |
| | | | Exp. Route Total | | | | | | | | 1.0E-05 | | | | | 0.01 |

**Table 7.2(a) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Table (Adult/Child Resident -Cancer and Adult Non-cancer)**

**Reasonable Maximum Exposure (RME) - Child Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 ft bgs to Water Table
Receptor Age: Adult/Child (cancer) and Non-cancer- Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 7,459 | mg/kg | 0.00195 | µg/m$^3$ | - | - | - | 5.25917E-06 | mg/m$^3$ | 0.005 | mg/m$^3$ | 1.05E-03 |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 0.000026 | µg/m$^3$ | 0.000571 | (µg/m$^3$)$^{-1}$ | 1.49E-08 | 6.76873E-11 | mg/m$^3$ | - | - | - |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 0.000000868 | µg/m$^3$ | 0.0043 | (µg/m$^3$)$^{-1}$ | 3.73E-09 | 2.33662E-09 | mg/m$^3$ | 0.000015 | mg/m$^3$ | 1.56E-04 |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.000593 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 3.56E-08 | 6.84658E-07 | mg/m$^3$ | - | - | - |
| | | | | Benzene | 2.643 | mg/kg | 0.000302 | µg/m$^3$ | 0.0000078 | (µg/m$^3$)$^{-1}$ | 2.36E-09 | 5.78626E-07 | mg/m$^3$ | 0.03 | mg/m$^3$ | 1.93E-05 |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 0.00000229 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 1.38E-09 | 2.22875E-09 | mg/m$^3$ | 0.000002 | mg/m$^3$ | 1.11E-03 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 0.00000311 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 1.86E-10 | 3.01843E-09 | mg/m$^3$ | - | - | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | 0.0000068 | µg/m$^3$ | 0.084 | (µg/m$^3$)$^{-1}$ | 5.72E-07 | 6.6115E-09 | mg/m$^3$ | 0.0001 | mg/m$^3$ | 6.61E-05 |
| | | | | Cobalt | 4.662 | mg/kg | 0.00000122 | µg/m$^3$ | 0.009 | (µg/m$^3$)$^{-1}$ | 1.10E-08 | 3.28707E-09 | mg/m$^3$ | 0.000006 | mg/m$^3$ | 5.48E-04 |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 0.000000303 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 1.82E-10 | 2.94722E-10 | mg/m$^3$ | - | - | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 0.000000848 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 5.09E-11 | 8.24234E-10 | mg/m$^3$ | - | - | - |
| | | | | Iron | 13,175 | mg/kg | 0.00345 | µg/m$^3$ | - | - | - | 9.28938E-06 | mg/m$^3$ | - | - | - |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | 0.00009 | µg/m$^3$ | - | - | - | 2.42264E-07 | mg/m$^3$ | 0.00005 | mg/m$^3$ | 4.85E-03 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.000323 | µg/m$^3$ | 0.0000041 | (µg/m$^3$)$^{-1}$ | 1.33E-09 | 6.06795E-07 | mg/m$^3$ | 0.002 | mg/m$^3$ | 3.03E-04 |
| | | | | Vanadium | 13.44 | mg/kg | 0.00000352 | µg/m$^3$ | - | - | - | 9.47623E-09 | mg/m$^3$ | - | - | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.00795 | µg/m$^3$ | 0.0000044 | (µg/m$^3$)$^{-1}$ | 3.50E-08 | 3.94843E-12 | mg/m$^3$ | 0.1 | mg/m$^3$ | 3.95E-11 |
| | | | Exp. Route Total | | | | | | | | 6.78E-07 | | | | | 0.008 |
| | | Exposure Point Total | | | | | | | | | 7.5E-05 | | | | | 0.125 |
| Exposure Medium Total | | | | | | | | | | | 7.5E-05 | | | | | 0.125 |
| Medium Total | | | | | | | | | | | 7.5E-05 | | | | | 0.125 |
| | | | | | | | | Total of Receptor Risks Across All Media | | | 7.5E-05 | Total of Receptor Hazards Across All Media | | | | 0.131 |

**Table 7.2(b) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Table (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Child Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 ft bgs to Water Table
Receptor Age: Adult/Child (cancer) and Non-cancer- Child

| Medium | Exposure | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to Water Table | Ingestion | Aluminum | 7,459 | mg/kg | 0.0107 | mg/kg-day | - | | - | 0.0954 | mg/kg-day | 1 | mg/kg-day | 0.1 |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 0.000000138 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 2.76E-07 | 0.00000123 | mg/kg-day | 2.00E-05 | mg/kg-day | 6.15E-02 |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 0.00000286 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | **4.29E-06** | 0.0000254 | mg/kg-day | 0.0003 | mg/kg-day | 0.08 |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.0000173 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **1.73E-06** | 0.0000338 | mg/kg-day | - | mg/kg-day | - |
| | | | | Benzene | 2.643 | mg/kg | 4.32E-09 | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | 2.37E-10 | 3.84E-08 | mg/kg-day | 0.004 | mg/kg-day | 0.00 |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 0.0000206 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **2.06E-05** | 0.0000404 | mg/kg-day | 0.0003 | mg/kg-day | 0.14 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 0.000028 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **2.80E-06** | 0.0000547 | mg/kg-day | - | mg/kg-day | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | 0.0000612 | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | **3.06E-05** | 0.00012 | mg/kg-day | 0.003 | mg/kg-day | 0.04 |
| | | | | Cobalt | 4.662 | mg/kg | 0.00000671 | mg/kg-day | - | | - | 0.0000596 | mg/kg-day | 0.0003 | mg/kg-day | 0.20 |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 0.00000273 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **2.73E-06** | 0.00000534 | mg/kg-day | - | mg/kg-day | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 0.00000763 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 7.63E-07 | 0.0000149 | mg/kg-day | - | mg/kg-day | - |
| | | | | Iron | 13,175 | mg/kg | 0.019 | mg/kg-day | - | | - | 0.168 | mg/kg-day | 0.7 | mg/kg-day | 0.24 |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | 0.000494 | mg/kg-day | - | | - | 0.00439 | mg/kg-day | 0.024 | mg/kg-day | 0.18 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 3.47E-09 | mg/kg-day | 0.046 | $(mg/kg\text{-}day)^{-1}$ | 1.59E-10 | 1.79E-08 | mg/kg-day | 0.0005 | mg/kg-day | 0.00 |
| | | | | Vanadium | 13.44 | mg/kg | 0.0000193 | mg/kg-day | - | | - | 0.000172 | mg/kg-day | 0.00504 | mg/kg-day | 0.03 |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 8.27E-08 | mg/kg-day | 0.72 | $(mg/kg\text{-}day)^{-1}$ | 5.96E-08 | 7.16E-08 | mg/kg-day | 0.003 | mg/kg-day | 2.39E-05 |
| | | | Exp. Route Total | | | | | | | | 6.4E-05 | | | | | 1.1E+00 |
| Soil | Soil | Soil 0 ft bgs to Water Table | Dermal | Aluminum | 7,459 | mg/kg | - | | - | | - | - | | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 5.44E-08 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 1.09E-07 | 0.000000408 | mg/kg-day | 2.00E-05 | mg/kg-day | 2.04E-02 |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 0.000000402 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 6.03E-07 | 0.00000302 | mg/kg-day | 0.0003 | mg/kg-day | 0.01 |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.00000576 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 5.76E-07 | 0.0000104 | mg/kg-day | - | | - |
| | | | | Benzene | 2.643 | mg/kg | - | | 0.055 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.004 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 0.00000689 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **6.89E-06** | 0.0000125 | mg/kg-day | 0.0003 | mg/kg-day | 0.04 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 0.00000933 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 9.33E-07 | 0.0000169 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | - | | 0.5 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.003 | mg/kg-day | - |
| | | | | Cobalt | 4.662 | mg/kg | - | | - | | - | - | | 0.0003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 0.000000911 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 9.11E-07 | 0.00000165 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 0.00000255 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.55E-07 | 0.00000461 | mg/kg-day | - | | - |
| | | | | Iron | 13,175 | mg/kg | - | | - | | - | - | | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | - | | - | | - | - | | 0.024 | mg/kg-day | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | | 0.046 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 13.44 | mg/kg | - | | - | | - | - | | 0.00504 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | | 0.72 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.003 | mg/kg-day | - |
| | | | Exp. Route Total | | | | | | | | 1.0E-05 | | | | | 0.07 |

**Table 7.2(b) - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Table (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Child Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 ft bgs to Water Table
Receptor Age: Adult/Child (cancer) and Non-cancer- Child

| Medium | Exposure | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 7,459 | mg/kg | 0.00195 | µg/m$^3$ | - | | - | 0.00000526 | mg/m$^3$ | 0.005 | mg/m$^3$ | 0.001 |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 0.000026 | µg/m$^3$ | 0.000571 | (µg/m$^3$)$^{-1}$ | 1.49E-08 | 7.01E-08 | mg/m$^3$ | - | | - |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 0.000000868 | µg/m$^3$ | 0.0043 | (µg/m$^3$)$^{-1}$ | 3.73E-09 | 2.34E-09 | mg/m$^3$ | 0.000015 | mg/m$^3$ | 0.0002 |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.000593 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 3.56E-08 | 0.000000576 | mg/m$^3$ | - | | - |
| | | | | Benzene | 2.643 | mg/kg | 0.000302 | µg/m$^3$ | 0.0000078 | (µg/m$^3$)$^{-1}$ | 2.36E-09 | 0.000000814 | mg/m$^3$ | 0.03 | mg/m$^3$ | 0.00003 |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 0.00000229 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 1.38E-09 | 2.23E-09 | mg/m$^3$ | 0.000002 | mg/m$^3$ | 0.001 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 0.00000311 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 1.86E-10 | 3.02E-09 | mg/m$^3$ | - | | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | 0.0000068 | µg/m$^3$ | 0.084 | (µg/m$^3$)$^{-1}$ | 5.72E-07 | 6.61E-09 | mg/m$^3$ | 0.0001 | mg/m$^3$ | 0.00007 |
| | | | | Cobalt | 4.662 | mg/kg | 0.00000122 | µg/m$^3$ | 0.009 | (µg/m$^3$)$^{-1}$ | 1.10E-08 | 3.29E-09 | mg/m$^3$ | 0.000006 | mg/m$^3$ | 0.0005 |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 0.000000303 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 1.82E-10 | 2.95E-10 | mg/m$^3$ | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 0.000000848 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 5.09E-11 | 8.25E-10 | mg/m$^3$ | - | | - |
| | | | | Iron | 13,175 | mg/kg | 0.00345 | µg/m$^3$ | - | | - | 0.00000929 | mg/m$^3$ | - | | - |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | 0.00009 | µg/m$^3$ | - | | - | 0.000000242 | mg/m$^3$ | 0.00005 | mg/m$^3$ | 0.005 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.000323 | µg/m$^3$ | 0.0000041 | (µg/m$^3$)$^{-1}$ | 1.33E-09 | 0.000000608 | mg/m$^3$ | 0.002 | mg/m$^3$ | 0.0003 |
| | | | | Vanadium | 13.44 | mg/kg | 0.00000352 | µg/m$^3$ | - | | - | 9.48E-09 | mg/m$^3$ | - | | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.00795 | µg/m$^3$ | 0.0000044 | (µg/m$^3$)$^{-1}$ | 3.50E-08 | 0.00000562 | mg/m$^3$ | 0.1 | mg/m$^3$ | 0.00006 |
| | | | Exp. Route Total | | | | | | | | 6.78E-07 | | | | | 0.01 |
| | | Exposure Point Total | | | | | | | | | 7.5E-05 | | | | | 1.2 |
| Exposure Medium Total | | | | | | | | | | | 7.5E-05 | | | | | 1.2 |
| Medium Total | | | | | | | | | | | 7.5E-05 | | | | | 1.2 |
| | | | | | | | | Total of Receptor Risks Across All Media | | | 7.5E-05 | Total of Receptor Hazards Across All Media | | | | 1.2 |

**Table 7.3 - Risk Asssessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to 2 ft bgs (Construction Worker)**

**Reasonable Maximum Exposure (RME) - Construction Worker**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Construction Worker (Soil from 0 ft bgs to 2 ft bgs)
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Adult Construction Worker | | | | | Non-Cancer Hazard Calculations - Adult Construction Worker | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Ingestion | Aluminum | 6,058 | mg/kg | 0.0000293 | mg/kg-day | - | | - | 0.0178 | mg/kg-day | 1 | $(mg/kg-day)^{-1}$ | 0.02 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 1.26E-09 | mg/kg-day | 2 | $(mg/kg-day)^{-1}$ | 2.53E-09 | 0.000000769 | mg/kg-day | 3.00E-05 | $(mg/kg-day)^{-1}$ | 0.03 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 1.04E-08 | mg/kg-day | 1.5 | $(mg/kg-day)^{-1}$ | 1.56E-08 | 0.00000632 | mg/kg-day | 0.005 | $(mg/kg-day)^{-1}$ | 0.001 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 6.34E-08 | mg/kg-day | 0.1 | $(mg/kg-day)^{-1}$ | 6.34E-09 | 0.0000386 | mg/kg-day | - | | - |
| | | | | Benzene | 0.003 | mg/kg | 1.45E-11 | mg/kg-day | 0.055 | $(mg/kg-day)^{-1}$ | 7.99E-13 | 8.84E-09 | mg/kg-day | 0.01 | $(mg/kg-day)^{-1}$ | 0.0000009 |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 5.68E-08 | mg/kg-day | 1 | $(mg/kg-day)^{-1}$ | 5.68E-08 | 0.0000345 | mg/kg-day | - | | |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 7.68E-08 | mg/kg-day | 0.1 | $(mg/kg-day)^{-1}$ | 7.68E-09 | 0.0000467 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.00000004 | mg/kg-day | 0.5 | $(mg/kg-day)^{-1}$ | 0.00000002 | 0.0000243 | mg/kg-day | 0.005 | $(mg/kg-day)^{-1}$ | 0.005 |
| | | | | Cobalt | 4.517 | mg/kg | 2.19E-08 | mg/kg-day | - | | - | 0.0000133 | mg/kg-day | 0.003 | $(mg/kg-day)^{-1}$ | 0.004 |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 6.67E-09 | mg/kg-day | 1 | $(mg/kg-day)^{-1}$ | 6.67E-09 | 0.00000406 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 1.87E-08 | mg/kg-day | 0.1 | $(mg/kg-day)^{-1}$ | 1.87E-09 | 0.0000114 | mg/kg-day | - | | - |
| | | | | Iron | 12,917 | mg/kg | 0.0000626 | mg/kg-day | - | | - | 0.0381 | mg/kg-day | 0.7 | $(mg/kg-day)^{-1}$ | 0.05 |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.00000212 | mg/kg-day | - | | - | 0.00129 | mg/kg-day | - | | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 6.78E-12 | mg/kg-day | 0.046 | $(mg/kg-day)^{-1}$ | 3.12E-13 | 4.13E-09 | mg/kg-day | 0.0005 | $(mg/kg-day)^{-1}$ | 0.000008 |
| | | | | Vanadium | 11.62 | mg/kg | 5.63E-08 | mg/kg-day | - | | - | 0.0000342 | mg/kg-day | 0.0007 | $(mg/kg-day)^{-1}$ | 0.05 |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 2.71E-11 | mg/kg-day | 0.72 | $(mg/kg-day)^{-1}$ | 1.95E-11 | 1.65E-08 | mg/kg-day | - | | 0.000006 |
| | | | Exp. Route Total | | | | | | | | 1.2E-07 | | | | | 0.2 |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Dermal | Aluminum | 6,058 | mg/kg | - | | - | | - | - | | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 5.67E-10 | mg/kg-day | 2 | $(mg/kg-day)^{-1}$ | 1.13E-09 | 0.000000345 | mg/kg-day | 3.00E-05 | mg/kg-day | 0.01 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 1.66E-09 | mg/kg-day | 1.5 | $(mg/kg-day)^{-1}$ | 2.5E-09 | 0.00000101 | mg/kg-day | 0.005 | mg/kg-day | 0.0002 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 2.64E-08 | mg/kg-day | 0.1 | $(mg/kg-day)^{-1}$ | 2.64E-09 | 0.0000161 | mg/kg-day | - | | - |
| | | | | Benzene | 0.003 | mg/kg | - | | 0.055 | $(mg/kg-day)^{-1}$ | - | - | | 0.01 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 2.37E-08 | mg/kg-day | 1 | $(mg/kg-day)^{-1}$ | 2.37E-08 | 0.0000144 | mg/kg-day | - | | 0.05 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.000000032 | mg/kg-day | 0.1 | $(mg/kg-day)^{-1}$ | 3.2E-09 | 0.0000195 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | - | | 0.5 | $(mg/kg-day)^{-1}$ | - | - | | 0.005 | mg/kg-day | - |
| | | | | Cobalt | 4.517 | mg/kg | - | | - | | - | - | | 0.003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 2.78E-09 | mg/kg-day | 1 | $(mg/kg-day)^{-1}$ | 2.78E-09 | 0.00000169 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 7.78E-09 | mg/kg-day | 0.1 | $(mg/kg-day)^{-1}$ | 7.78E-10 | 0.00000473 | mg/kg-day | - | | - |
| | | | | Iron | 12,917 | mg/kg | - | | - | | - | - | | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | - | | - | | - | - | | - | | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | | 0.046 | $(mg/kg-day)^{-1}$ | - | - | | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 11.62 | mg/kg | - | | - | | - | - | | 0.0007 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | | 0.72 | $(mg/kg-day)^{-1}$ | - | - | | - | | - |
| | | | Exp. Route Total | | | | | | | | 3.7E-08 | | | | | 0.06 |

**Table 7.3 - Risk Asssessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to 2 ft bgs (Construction Worker)**

**Reasonable Maximum Exposure (RME) - Construction Worker**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Construction Worker (Soil from 0 ft bgs to 2 ft bgs)
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Adult Construction Worker | | | | | Non-Cancer Hazard Calculations - Adult Construction Worker | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 6,058 | mg/kg | 0.00000174 | $\mu g/m^3$ | - | | - | 0.00000106 | $mg/m^3$ | - | | 0.0002 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.00000106 | $\mu g/m^3$ | 0.000571 | $(\mu g/m^3)^{-1}$ | 6.06E-10 | 0.000000645 | $mg/m^3$ | - | | - |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 1.03E-09 | $\mu g/m^3$ | 0.0043 | $(\mu g/m^3)^{-1}$ | 4.42E-12 | 6.26E-10 | $mg/m^3$ | - | | 0.00004 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 0.0000159 | $\mu g/m^3$ | 0.00006 | $(\mu g/m^3)^{-1}$ | 9.51E-10 | 0.00000965 | $mg/m^3$ | - | | - |
| | | | | Benzene | 0.003 | mg/kg | 0.00000453 | $\mu g/m^3$ | 0.0000078 | $(\mu g/m^3)^{-1}$ | 3.53E-11 | 0.00000276 | $mg/m^3$ | 0.08 | $mg/m^3$ | 0.00003 |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 3.37E-09 | $\mu g/m^3$ | 0.0006 | $(\mu g/m^3)^{-1}$ | 2.02E-12 | 2.05E-09 | $mg/m^3$ | - | | 0.001 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 4.56E-09 | $\mu g/m^3$ | 0.00006 | $(\mu g/m^3)^{-1}$ | 2.74E-13 | 2.78E-09 | $mg/m^3$ | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 2.38E-09 | $\mu g/m^3$ | 0.084 | $(\mu g/m^3)^{-1}$ | 2E-10 | 1.45E-09 | $mg/m^3$ | 0.0003 | $mg/m^3$ | 0.000005 |
| | | | | Cobalt | 4.517 | mg/kg | 1.3E-09 | $\mu g/m^3$ | 0.009 | $(\mu g/m^3)^{-1}$ | 1.17E-11 | 7.91E-10 | $mg/m^3$ | 0.00002 | $mg/m^3$ | 0.00004 |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 3.96E-10 | $\mu g/m^3$ | 0.0006 | $(\mu g/m^3)^{-1}$ | 2.38E-13 | 2.41E-10 | $mg/m^3$ | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 1.11E-09 | $\mu g/m^3$ | 0.00006 | $(\mu g/m^3)^{-1}$ | 6.65E-14 | 6.75E-10 | $mg/m^3$ | - | | - |
| | | | | Iron | 12,917 | mg/kg | 0.00000372 | $\mu g/m^3$ | - | | - | 0.00000226 | $mg/m^3$ | - | | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.000000126 | $\mu g/m^3$ | - | | - | 7.65E-08 | $mg/m^3$ | - | | 0.002 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.00000338 | $\mu g/m^3$ | 0.0000041 | $(\mu g/m^3)^{-1}$ | 1.39E-11 | 0.00000206 | $mg/m^3$ | 0.00215 | $mg/m^3$ | 0.001 |
| | | | | Vanadium | 11.62 | mg/kg | 3.34E-09 | $\mu g/m^3$ | - | | - | 2.03E-09 | $mg/m^3$ | - | | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.0000313 | $\mu g/m^3$ | 0.0000044 | $(\mu g/m^3)^{-1}$ | 1.38E-10 | 0.000019 | $mg/m^3$ | 0.0767 | $mg/m^3$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 1.96E-09 | | | | | 0.004 |
| | | Exposure Point Total | | | | | | | | | 1.6E-07 | | | | | 0.2 |
| Exposure Medium Total | | | | | | | | | | | 1.6E-07 | | | | | 0.2 |
| Medium Total | | | | | | | | | | | 1.6E-07 | | | | | 0.2 |
| | | | | | | | | Total of Receptor Risks Across All Media | | | 1.6E-07 | Total of Receptor Hazards Across All Media | | | | 0.2 |

**Table 7.4 - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Table (Construction Worker)**

**Reasonable Maximum Exposure (RME) - Construction Worker**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Construction Worker (Soil from 0 ft bgs to Water Table)
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Adult Construction Worker | | | | | Non-Cancer Hazard Calculations - Construction Worker | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to Water Table | Ingestion | Aluminum | 7,459 | mg/kg | 0.0000361 | mg/kg-day | - | | - | 0.022 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 0.02 |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 4.65E-10 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 9.3E-10 | 0.000000283 | mg/kg-day | 0.00003 | $(mg/kg\text{-}day)^{-1}$ | 0.009 |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 9.63E-09 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 1.44E-08 | 0.00000586 | mg/kg-day | 0.005 | $(mg/kg\text{-}day)^{-1}$ | 0.001 |
| | | | | Benzo[a]anthracene | 2.643 | mg/kg | 1.28E-08 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 1.28E-09 | 0.00000779 | mg/kg-day | - | | - |
| | | | | Benzene | 0.003 | mg/kg | 1.45E-11 | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | 7.99E-13 | 8.84E-09 | mg/kg-day | 0.01 | $(mg/kg\text{-}day)^{-1}$ | 0.0000009 |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 1.53E-08 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 1.53E-08 | 0.00000931 | mg/kg-day | - | | 0.03 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 2.07E-08 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.07E-09 | 0.0000126 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | 4.54E-08 | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | 2.27E-08 | 0.0000276 | mg/kg-day | 0.005 | $(mg/kg\text{-}day)^{-1}$ | 0.006 |
| | | | | Cobalt | 4.662 | mg/kg | 2.26E-08 | mg/kg-day | - | | - | 0.0000137 | mg/kg-day | 0.003 | $(mg/kg\text{-}day)^{-1}$ | 0.005 |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 2.02E-09 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 2.02E-09 | 0.00000123 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 5.66E-09 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 5.66E-10 | 0.00000344 | mg/kg-day | - | | - |
| | | | | Iron | 13,175 | mg/kg | 0.0000638 | mg/kg-day | - | | - | 0.0388 | mg/kg-day | 0.7 | $(mg/kg\text{-}day)^{-1}$ | 0.06 |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | 0.00000166 | mg/kg-day | - | | - | 0.00101 | mg/kg-day | - | | 0.04 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 6.78E-12 | mg/kg-day | 0.046 | $(mg/kg\text{-}day)^{-1}$ | 3.12E-13 | 4.13E-09 | mg/kg-day | 0.0005 | $(mg/kg\text{-}day)^{-1}$ | 0.000008 |
| | | | | Vanadium | 13.44 | mg/kg | 6.51E-08 | mg/kg-day | - | | - | 0.0000396 | mg/kg-day | 0.0007 | $(mg/kg\text{-}day)^{-1}$ | 0.06 |
| | | | | Vinyl Chloirde | 0.0056 | mg/kg | 2.71E-11 | mg/kg-day | 0.72 | $(mg/kg\text{-}day)^{-1}$ | 1.95E-11 | 1.65E-08 | mg/kg-day | - | | 0.000006 |
| | | | Exp. Route Total | | | | | | | | 5.9E-08 | | | | | 0.23 |
| Soil | Soil | Soil from 0 ft bgs to Water Table | Dermal | Aluminum | 7,459 | mg/kg | - | | - | | - | - | | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 2.09E-10 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 4.17E-10 | 0.000000127 | mg/kg-day | 0.00003 | mg/kg-day | 0.00423 |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 1.54E-09 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 2.32E-09 | 0.000000939 | mg/kg-day | 0.005 | mg/kg-day | 0.000188 |
| | | | | Benzene | 2.643 | mg/kg | 5.34E-09 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 5.34E-10 | 0.00000325 | mg/kg-day | - | | - |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | - | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.01 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 6.38E-09 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 6.38E-09 | 0.00000388 | mg/kg-day | - | mg/kg-day | 0.0129 |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 8.64E-09 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 8.64E-10 | 0.00000526 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | - | | 0.5 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.005 | mg/kg-day | - |
| | | | | Cobalt | 4.662 | mg/kg | - | | - | | - | - | | 0.003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 8.44E-10 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 8.44E-10 | 0.000000513 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 2.36E-09 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 2.36E-10 | 0.00000144 | mg/kg-day | - | | - |
| | | | | Iron | 13,175 | mg/kg | - | | - | | - | - | | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | - | | - | | - | - | | - | | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | | 0.046 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 13.44 | mg/kg | - | | - | | - | - | | 0.0007 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | | 0.72 | $(mg/kg\text{-}day)^{-1}$ | - | - | | - | | - |
| | | | Exp. Route Total | | | | | | | | 1.2E-08 | | | | | 0.02 |

**Table 7.4 - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Table (Construction Worker)**

**Reasonable Maximum Exposure (RME) - Construction Worker**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Construction Worker (Soil from 0 ft bgs to Water Table)
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Adult Construction Worker | | | | | Non-Cancer Hazard Calculations - Construction Worker | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 7,459 | mg/kg | 0.00000215 | µg/m$^3$ | - | | - | 0.00000131 | mg/m$^3$ | - | | - |
| | | | | Aroclor 1260 | 0.096 | mg/kg | 0.000000608 | µg/m$^3$ | 0.000571 | (µg/m$^3$)$^{-1}$ | 3.47E-10 | 0.00000037 | mg/m$^3$ | - | | - |
| | | | | Arsenic, Inorganic | 3.314 | mg/kg | 9.54E-10 | µg/m$^3$ | 0.0043 | (µg/m$^3$)$^{-1}$ | 4.1E-12 | 5.8E-10 | mg/m$^3$ | - | | - |
| | | | | Benzene | 2.643 | mg/kg | 0.0000032 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 1.92E-10 | 0.00000195 | mg/m$^3$ | - | | - |
| | | | | Benz[a]anthracene | 0.003 | mg/kg | 0.00000453 | µg/m$^3$ | 0.0000078 | (µg/m$^3$)$^{-1}$ | 3.53E-11 | 0.00000276 | mg/m$^3$ | 0.08 | mg/m$^3$ | 0.00003 |
| | | | | Benzo[a]pyrene | 3.161 | mg/kg | 9.1E-10 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 5.46E-13 | 5.53E-10 | mg/m$^3$ | - | | - |
| | | | | Benzo[b]fluoranthene | 4.281 | mg/kg | 1.23E-09 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 7.39E-14 | 7.49E-10 | mg/m$^3$ | - | | - |
| | | | | Chromium(VI) | 9.377 | mg/kg | 2.7E-09 | µg/m$^3$ | 0.084 | (µg/m$^3$)$^{-1}$ | 2.27E-10 | 1.64E-09 | mg/m$^3$ | 0.0003 | mg/m$^3$ | 0.000005 |
| | | | | Cobalt | 4.662 | mg/kg | 1.34E-09 | µg/m$^3$ | 0.009 | (µg/m$^3$)$^{-1}$ | 1.21E-11 | 8.16E-10 | mg/m$^3$ | 0.00002 | mg/m$^3$ | 0.00004 |
| | | | | Dibenz[a,h]anthracene | 0.418 | mg/kg | 1.2E-10 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 7.22E-14 | 7.32E-11 | mg/m$^3$ | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 1.169 | mg/kg | 3.36E-10 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 2.02E-14 | 2.05E-10 | mg/m$^3$ | - | | - |
| | | | | Iron | 13,175 | mg/kg | 0.00000379 | µg/m$^3$ | - | | - | 0.00000231 | mg/m$^3$ | - | | - |
| | | | | Manganese (Non-diet) | 343.6 | mg/kg | 9.89E-08 | µg/m$^3$ | - | | - | 6.02E-08 | mg/m$^3$ | - | | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.00000338 | µg/m$^3$ | 0.0000041 | (µg/m$^3$)$^{-1}$ | 1.39E-11 | 0.00000206 | mg/m$^3$ | 0.00215 | mg/m$^3$ | 0.001 |
| | | | | Vanadium | 13.44 | mg/kg | 3.87E-09 | µg/m$^3$ | - | | - | 2.35E-09 | mg/m$^3$ | - | | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.0000313 | µg/m$^3$ | 0.0000044 | (µg/m$^3$)$^{-1}$ | 1.38E-10 | 0.000019 | mg/m$^3$ | 0.0767 | mg/m$^3$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 9.70E-10 | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | 7.1E-08 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | 7.1E-08 | | | | | 0.2 |
| Medium Total | | | | | | | | | | | 7.2E-08 | | | | | 0.2 |
| | | | | | | | | Total of Receptor Risks Across All Media | | | 7.2E-08 | Total of Receptor Hazards Across All Media | | | | 0.2 |

**TABLE 9.1 - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Reasonable Maximum Exposure (RME) - Future Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

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

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient (Child) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil (0 to 2 feet) | Surface Soil | SS-017 | Aluminum | - | - | - | | | Nervous system and morphological developmental | 0.08 | | - | 0.08 |
| | | | | | | | | | Brain (psychomotor and cognitive impairment effects) | | 0.0009 | | 0.0009 |
| | | | Aroclor 1260 | 7.51E-07 | 4.05E-08 | 2.96E-07 | | 1.1E-06 | Ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails; decreased antibody (IgG and IgM) response to sheep erythrocytes. Based on oral RfD for Aroclor 1254. | 0.20 | | 0.06 | 0.3 |
| | | | | | | | | | NA | | - | | - |
| | | | Arsenic, Inorganic | 4.63E-06 | 4.03E-09 | 6.51E-07 | | 5.3E-06 | Hyperpigmentation, keratosis and possible vascular complications | 0.09 | | 0.01 | 0.1 |
| | | | | | | | | | Reproductive/ development; cardiovascular system; nervous system; lung; skin | | 0.0002 | | 0.0002 |
| | | | Benzene | 8.55E-06 | 1.76E-07 | 2.85E-06 | | 1.2E-05 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Benz[a]anthracene | 2.37E-10 | 2.36E-09 | - | | 2.6E-09 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Benzo[a]pyrene | 7.65E-05 | 5.1E-09 | 2.55E-05 | | 1.0E-04 | Developmental toxicity (Nervous system) | **0.5** | | **0.2** | 0.7 |
| | | | | | | | | | Developmental toxicity (Reproductive system) | | 0.004 | | 0.004 |
| | | | Benzo[b]fluoranthene | 1.04E-05 | 6.9E-10 | 3.46E-06 | | 1.4E-05 | NA | - | | - | NA |
| | | | | | | | | | NA | | - | | NA |
| | | | Chromium (VI) | 2.70E-05 | 5.03E-07 | - | | 2.8E-05 | Gastrointestinal tract | 0.04 | | - | 0.04 |
| | | | | | | | | | Respiratory system | | 0.00006 | | 0.00006 |
| | | | Cobalt | - | 1.07E-08 | - | | 1.1E-08 | Thyroid | **0.2** | | - | 0.2 |
| | | | | | | | | | Respiratory tract and lung | | 0.0005 | | 0.0005 |
| | | | Dibenz[a,h]anthracene | 8.99E-06 | 5.99E-10 | 3.00E-06 | | 1.2E-05 | NA | - | | - | NA |
| | | | | | | | | | NA | | - | | NA |
| | | | Indeno[1,2,3-cd]pyrene | 2.52E-06 | 1.68E-10 | 8.40E-07 | | 3.4E-06 | NA | - | | - | NA |
| | | | | | | | | | NA | | - | | NA |
| | | | Iron | - | - | - | | - | Gastrointestinal tract | 0.2 | | - | 0.2 |
| | | | | | | | | | NA | | - | | NA |
| | | | Manganese (Non-diet) | - | - | - | | - | Nervous system | 0.2 | | - | 0.2 |
| | | | | | | | | | Impairment of neurobehavioral function | | 0.006 | | 0.006 |
| | | | Trichloroethylene | 1.59E-10 | 1.33E-09 | - | | 1.5E-09 | Cardiac malformations in fetus | 0.00004 | | - | 0.00004 |
| | | | | | | | | | Decreased thymus weight in B6C3F1 mice | | 0.0003 | | 0.0003 |
| | | | Vanadium | - | - | - | | | Nervous system | 0.03 | | - | 0.03 |
| | | | | | | | | - | NA | | - | | NA |
| | | | Vinyl Chloride | 5.96E-08 | 3.5E-08 | - | | 9.5E-08 | Liver cell polymorphism | 0.00002 | | - | 0.00002 |
| | | | | | | | | | Liver cell polymorphism | | 0.00006 | | 0.00006 |
| | | Exposure Point Total | | | | | | 1.8E-04 | | | | | 1.8 |
| | Exposure Medium Total | | | | | | | 1.8E-04 | | | | | 1.8 |
| Medium Total | | | | | | | | 1.8E-04 | | | | | 1.8 |
| Receptor Total | | | | | | | Receptor Risk Total | 1.8E-04 | | | | Receptor HI Total | 1.8 |

| | |
|---|---|
| Total Developmental HI Across All Media = | 0.66 |
| Total Neurological System HI Across All Media = | 0.35 |
| Total Gastrointestinal HI Across All Media = | 0.27 |
| Total Immune HI Across All Media = | 0.26 |
| Total Thyroid HI Across All Media = | 0.19 |
| Total Skin and Blood HI Across All Media = | 0.10 |
| Total Respiratory Hi Across All Media = | 0.001 |
| Total Thymus HI Across Media = | 0.0003 |
| Total Reproductive HI Across All Media = | 0.0002 |
| Total Liver HI Across Media = | 0.0001 |
| Total Cardiac Hi Across All Media = | 0.00004 |

**TABLE 9.2 - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ftbgs to Water Table (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Reasonable Maximum Exposure (RME) -Future Resident**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

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

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk: Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Non-Carcinogenic Hazard Quotient (Child): Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soil (0 ft bgs to Water Table) | Soil | SS-017 | Aluminum | - | - | - | | - | Nervous system and morphological developmental | 0.1 | | - | 0.1 |
| | | | | | | | | | Brain (psychomotor and cognitive impairment effects) | | 0.001 | | 0.001 |
| | | | Aroclor 1260 | 2.76E-07 | 1.49E-08 | 1.09E-07 | | 4.0E-07 | Ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails; decreased antibody (IgG and IgM) response to sheep erythrocytes. Based on oral RfD for Aroclor 1254. | 0.07 | | 0.02 | 0.09 |
| | | | | | | | | | NA | | - | | - |
| | | | Arsenic, Inorganic | 4.29E-06 | 3.73E-09 | 6.03E-07 | | 4.9E-06 | Hyperpigmentation, keratosis and possible vascular complications | 0.08 | | 0.01 | 0.09 |
| | | | | | | | | | Reproductive/ development; cardiovascular system; nervous system; lung; skin | | 0.0002 | | 0.0002 |
| | | | Benz[a]anthracene | 1.73E-06 | 3.56E-08 | 5.76E-07 | | 2.3E-06 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Benzene | 2.37E-10 | 2.36E-09 | - | | | NA | - | | - | - |
| | | | | | | | | | NA | | | | - |
| | | | Benzo[a]pyrene | 2.06E-05 | 1.38E-09 | 6.89E-06 | | 2.7E-05 | Developmental toxicity (Nervous system) | **0.1** | | 0.04 | 0.2 |
| | | | | | | | | | Developmental toxicity (Reproductive system) | | 0.001 | | 0.001 |
| | | | Benzo[b]fluoranthene | 2.80E-06 | 1.86E-10 | 9.33E-07 | | 3.7E-06 | NA | - | | - | - |
| | | | | | | | | | NA | | | | - |
| | | | Chromium(VI) | 3.06E-05 | 5.72E-07 | - | | 3.1E-05 | Gastrointestinal tract | 0.04 | | - | 0.04 |
| | | | | | | | | | Respiratory system | | 0.00007 | | 0.00007 |
| | | | Cobalt | - | 1.10E-08 | - | | 1.1E-08 | Thyroid | **0.2** | | - | 0.2 |
| | | | | | | | | | Respiratory tract and lung | | 0.0005 | | 0.0005 |
| | | | Dibenz[a,h]anthracene | 2.73E-06 | 1.82E-10 | 9.11E-07 | | 3.6E-06 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Indeno[1,2,3-cd]pyrene | 7.63E-07 | 5.09E-11 | 2.55E-07 | | 1.0E-06 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Iron | - | - | - | | - | Gastrointestinal tract | **0.2** | | - | 0.2 |
| | | | | | | | | | NA | | - | | - |
| | | | Manganese (Non-diet) | - | - | - | | - | Nervous system | **0.2** | | - | 0.2 |
| | | | | | | | | | Impairment of neurobehavioral function | | 0.005 | | 0.005 |
| | | | Trichloroethylene | 1.59E-10 | 1.33E-09 | - | | 1.5E-09 | Cardiac malformations in fetus | 0.00004 | | - | 0.00004 |
| | | | | | | | | | Decreased thymus weight in B6C3F1 mice | | 0.0003 | | 0.0003 |
| | | | Vanadium | - | - | - | | | Nervous system | 0.03 | | - | 0.03 |
| | | | | | | | | - | Hair | | - | | - |
| | | | Vinyl Chloride | 5.96E-08 | 3.50E-08 | - | | 9.5E-08 | Liver cell polymorphism | 0.00002 | | - | 0.00002 |
| | | | | | | | | | Liver cell polymorphism | | 0.00006 | | 0.00006 |
| | | | | | | | | 7.5E-05 | | | | | 1.2 |
| | | Exposure Point Total | | | | | | 7.5E-05 | | | | | 1.2 |
| | Exposure Medium Total | | | | | | | 7.5E-05 | | | | | 1.2 |
| Medium Total | | | | | | | | 7.5E-05 | | | | | 1.2 |
| Receptor Total | | | | | | | Receptor Risk Total | 7.5E-05 | | | | Receptor HI Total | 1.2 |

| | |
|---|---|
| Total Neurological System HI Across All Media = | 0.32 |
| Total Gastrointestinal HI Across All Media = | 0.28 |
| Total Thyroid Hi Across All Media = | 0.20 |
| Total Developmental HI Across All Media = | 0.18 |
| Total Immune HI Across All Media = | 0.09 |
| Total Skin and Blood HI Across All Media = | 0.09 |
| Total Respiratory Hi Across All Media = | 0.001 |
| Total Thymus HI Across Media = | 0.0003 |
| Total Reproductive HI Across All Media = | 0.0002 |
| Total Liver HI Across Media = | 0.0001 |
| Total Cardiac HI Across All Media = | 0.00004 |

**TABLE 9.3 - Risk Assessment Guidance for Superfund Part D Tables**
**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult Construction Worker)**
**Reasonable Maximum Exposure (RME) - Construction Worker**
**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

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

| | | | | Carcinogenic Risk (Adult Construction Worker) | | | | | Non-Carcinogenic Hazard Quotient (Adult Construction Worker) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil (0 to 2 feet) | Surface Soil | SS-017 | Aluminum | - | - | - | | | Impaired performance on the water maze test in females; shorter latency to fall in wire suspension test in males | 0.02 | | - | 0.02 |
| | | | | | | | | | | | 0.0002 | | 0.0002 |
| | | | Aroclor 1260 | 2.53E-09 | 6.06E-10 | 1.13E-09 | | 4.3E-09 | Immune Effects | 0.03 | | 0.01 | 0.04 |
| | | | | | | | | | | | - | | - |
| | | | Arsenic, Inorganic | 1.56E-08 | 4.42E-12 | 2.5E-09 | | 1.8E-08 | Hyperpigmentation and hyperkeratosis | 0.001 | | 0.0002 | 0.001 |
| | | | | | | | | | | | 0.00004 | | 0.00004 |
| | | | Benz[a]anthracene | 6.34E-09 | 9.51E-10 | 2.64E-09 | | 9.9E-09 | | - | | - | - |
| | | | | | | | | | | | - | | - |
| | | | Benzene | 7.99E-13 | 3.53E-11 | - | | 3.6E-11 | Decreased lymphocyte count | 0.0000009 | | - | 0.0000009 |
| | | | | | | | | | Decreased lymphocyte count | | 0.00003 | | 0.00003 |
| | | | Benzo[a]pyrene | 5.68E-08 | 2.02E-12 | 2.37E-08 | | 8.1E-08 | | | | 0.05 | 0.05 |
| | | | | | | | | | | | 0.001 | | 0.001 |
| | | | Benzo[b]fluoranthene | 7.68E-09 | 2.74E-13 | 3.2E-09 | | 1.1E-08 | | - | | - | - |
| | | | | | | | | | | | - | | - |
| | | | Chromium(VI) | 2.00E-08 | 2E-10 | - | | 2.0E-08 | Microcytic, hypochromic anemia | 0.005 | | - | 0.005 |
| | | | | | | | | | Increased lung weight; hyperplasia; macrophage infiltration; increased protein, albumin, lactate dehydrogenase in BAL fluid | | 0.000005 | | 0.000005 |
| | | | Cobalt | - | 1.17E-11 | - | | 1.2E-11 | Decreased iodine uptake | 0.004 | | - | 0.004 |
| | | | | | | | | | Irritation; Decreased function | | 0.00004 | | 0.00004 |
| | | | Dibenz[a,h]anthracene | 6.67E-09 | 2.38E-13 | 2.78E-09 | | 9.5E-09 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Indeno[1,2,3-cd]pyrene | 1.87E-09 | 6.65E-14 | 7.78E-10 | | 2.6E-09 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Iron | - | - | - | | - | Adverse gastrointestinal effects | 0.05 | | - | 0.05 |
| | | | | | | | | | NA | | - | | - |
| | | | Manganese (Non-diet) | - | - | - | | - | NA | - | | - | |
| | | | | | | | | | | | 0.002 | | 0.002 |
| | | | Trichloroethylene | 3.12E-13 | 1.39E-11 | - | | 1.4E-11 | Increased incidence of congenital heart abnormalities/30% decreased thymus weight, increased serum levels of IgG and selected autoantibodies/Decreased PFC response in male and female pups, increased hypersensitivity response in male pups | 0.000008 | | - | 0.000008 |
| | | | | | | | | | Cardiac malformations in rat fetuses/decreased thymus weight in adult mice | | 0.001 | | 0.001 |
| | | | Vanadium | - | - | - | | | Histopathology Kidney | 0.05 | | - | 0.05 |
| | | | | | | | | - | NA | | - | | - |
| | | | Vinyl Chloride | 1.95E-11 | 1.38E-10 | - | | 1.6E-10 | | 0.000006 | | - | |
| | | | | | | | | | Centrilobular hypertrophy | | 0.0002 | | 0.0002 |
| | | Exposure Point Total | | | | | | 1.6E-07 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 1.6E-07 | | | | | 0.2 |
| Medium Total | | | | | | | | 1.6E-07 | | | | | 0.2 |
| Receptor Total | | | | | | | Receptor Risk Total | 1.6E-07 | | | | Receptor HI Total | 0.2 |

| | |
|---|---|
| Total Nervous System HI Across All Media = | 0.02 |
| Total Immune System HI Across All Media = | 0.04 |
| Total Skin HI Across All Media = | 0.001 |
| Total Blood HI Across All Media = | 0.005 |
| Total Respiratory Sytsem HI Across All Media = | 0.00004 |
| Total Thyroid HI Across All Media = | 0.004 |
| Total Gastrointestinal System HI Across All Media = | 0.05 |
| Total Developmental System HI Across All Media = | 0.001 |
| Total Kidney Across All Media = | 0.05 |
| Total Liver Across All Media = | 0.0002 |

**TABLE 9.4 - Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 ft bgs to Water Tavle (Adult Construction Worker)**

**Reasonable Maximum Exposure (RME) - Construction Worker**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

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

| | | | | Carcinogenic Risk - Adult Construction Worker | | | | | Non-Carcinogenic Hazard Quotient - Adult Construction Worker | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil (0 ft bgs to Water Table) | Soil | SS-017 | Aluminum | - | - | - | | | Impaired performance on the water maze test in females; shorter latency to fall in wire suspension test in males | 0.02 | | - | 0.02 |
| | | | | | | | | | | | - | | |
| | | | Aroclor 1260 | 9.3E-10 | 3.47E-10 | 4.17E-10 | | 1.7E-09 | Immune Effects | 0.009 | | 0.004 | 0.01 |
| | | | | | | | | | | | - | | - |
| | | | Arsenic, Inorganic | 1.44E-08 | 4.1E-12 | 2.32E-09 | | 1.7E-08 | Hyperpigmentation and hyperkeratosis | 0.001 | | 0.0002 | 0.001 |
| | | | | | | | | | | | - | | |
| | | | Benzene | 1.28E-09 | 1.92E-10 | 5.34E-10 | | 2.0E-09 | | - | | - | NA |
| | | | | | | | | | | | - | | NA |
| | | | Benz[a]anthracene | 7.99E-13 | 3.53E-11 | - | | 3.6E-11 | Decreased lymphocyte count | 0.000000884 | | - | 0.0000009 |
| | | | | | | | | | Decreased lymphocyte count | | 0.00003 | | 0.00003 |
| | | | Benzo[a]pyrene | 1.53E-08 | 5.46E-13 | 6.38E-09 | | 2.2E-08 | | 0.03 | | 0.01 | 0.04390 |
| | | | | | | | | | | | - | | 0.00000 |
| | | | Benzo[b]fluoranthene | 2.07E-09 | 7.39E-14 | 8.64E-10 | | 2.9E-09 | | - | | - | NA |
| | | | | | | | | | | | - | | NA |
| | | | Chromium(VI) | 2.27E-08 | 2.27E-10 | - | | 2.3E-08 | Microcytic, hypochromic anemia | 0.00553 | | - | 0.006 |
| | | | | | | | | | Increased lung weight; hyperplasia; macrophage infiltration; increased protein, albumin, lactate dehydrogenase in BAL fluid | | 0.000005 | | 0.000005 |
| | | | Cobalt | - | 1.21E-11 | - | | 1.2E-11 | Decreased iodine uptake | 0.00458 | | - | 0.005 |
| | | | | | | | | | Irritation; Decreased function | | 0.00004 | | 0.00004 |
| | | | Dibenz[a,h]anthracene | 2.02E-09 | 7.22E-14 | 8.44E-10 | | 2.9E-09 | | - | | - | NA |
| | | | | | | | | | | | - | | NA |
| | | | Indeno[1,2,3-cd]pyrene | 5.66E-10 | 2.02E-14 | 2.36E-10 | | 8.0E-10 | | - | | - | NA |
| | | | | | | | | | | | - | | NA |
| | | | Iron | - | - | - | | - | Adverse gastrointestinal effects | 0.0555 | | - | 0.06 |
| | | | | | | | | | | | - | | NA |
| | | | Manganese (Non-diet) | - | - | - | | - | | 0.04 | | - | 0.04 |
| | | | | | | | | | | | - | | - |
| | | | Trichloroethylene | 3.12E-13 | 1.39E-11 | - | | 1.4E-11 | Increased incidence of congenital heart abnormalities/30% decreased thymus weight, increased serum levels of IgG and selected autoantibodies/Decreased PFC response in male and female pups, increased hypersensitivity response in male pups | 0.000008 | | - | 0.000008 |
| | | | | | | | | | Cardiac malformations in rat fetuses/decreased thymus weight in adult mice | | 0.001 | | 0.001 |
| | | | Vanadium | - | - | - | | | Histopathology Kidney | 0.06 | | - | 0.06 |
| | | | | | | | | - | | | - | | NA |
| | | | Vinyl Chloride | 1.95E-11 | 1.38E-10 | - | | 1.6E-10 | | 0.000006 | | - | 0.00 |
| | | | | | | | | | Centrilobular hypertrophy | | 0.0002 | | 0.0002 |
| | | | | | | | | 7.2E-08 | | | | | 0.25 |
| | | Exposure Point Total | | | | | | 7.2E-08 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 7.2E-08 | | | | | 0.2 |
| Medium Total | | | | | | | | 7.2E-08 | | | | | 0.2 |
| Receptor Total | | | | | | Receptor Risk Total | | 7.2E-08 | | | | Receptor HI Total | 0.2 |

| | |
|---|---|
| Total Nervous System HI Across All Media = | 0.02 |
| Total Immune System HI Across All Media = | 0.01 |
| Total Skin HI Across All Media = | 0.001 |
| Total Blood HI Across All Media = | 0.006 |
| Total Respiratory Sytsem HI Across All Media = | 0.00005 |
| Total IThyroid HI Across All Media = | 0.005 |
| Total Gastrointestinal System HI Across All Media = | 0.06 |
| Total Developmental System HI Across All Media = | 0.001 |
| Total Kidney Across All Media = | 0.06 |
| Total Liver Across All Media = | 0.0002 |

# APPENDIX D
# PROUCL OUTPUTS

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# Resident - Scenario 1
# (soil from 0 ft bgs to 2 ft bgs)

## UCL Statistics for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.12/15/2018 4:54:56 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Benzo[a]anthracene**

### General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 16 | Number of Distinct Observations | 16 |
| Number of Detects | 15 | Number of Non-Detects | 1 |
| Number of Distinct Detects | 15 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.0092 | Minimum Non-Detect | 0.0024 |
| Maximum Detect | 19 | Maximum Non-Detect | 0.0024 |
| Variance Detects | 23.71 | Percent Non-Detects | 6.25% |
| Mean Detects | 1.433 | SD Detects | 4.869 |
| Median Detects | 0.091 | CV Detects | 3.398 |
| Skewness Detects | 3.848 | Kurtosis Detects | 14.86 |
| Mean of Logged Detects | -2.152 | SD of Logged Detects | 1.855 |

### Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.32 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.881 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.455 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.22 | 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

| | | | |
|---|---|---|---|
| KM Mean | 1.344 | KM Standard Error of Mean | 1.182 |
| KM SD | 4.568 | 95% KM (BCA) UCL | 3.705 |
| 95% KM (t) UCL | 3.416 | 95% KM (Percentile Bootstrap) UCL | 3.662 |
| 95% KM (z) UCL | 3.288 | 95% KM Bootstrap t UCL | 73.81 |
| 90% KM Chebyshev UCL | 4.89 | 95% KM Chebyshev UCL | 6.496 |
| 97.5% KM Chebyshev UCL | 8.726 | 99% KM Chebyshev UCL | 13.1 |

### Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 2.601 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.846 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.373 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.241 | 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) | 0.278 | k star (bias corrected MLE) | 0.267 |
| Theta hat (MLE) | 5.156 | Theta star (bias corrected MLE) | 5.371 |
| nu hat (MLE) | 8.338 | nu star (bias corrected) | 8.004 |
| Mean (detects) | 1.433 | | |

### Gamma ROS Statistics using Imputed Non-Detects

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 54 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 55 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 56 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 57 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 58 | | | | | Minimum | 0.0092 | | | | Mean | 1.344 | |
| 59 | | | | | Maximum | 19 | | | | Median | 0.081 | |
| 60 | | | | | SD | 4.718 | | | | CV | 3.51 | |
| 61 | | | | | k hat (MLE) | 0.27 | | | | k star (bias corrected MLE) | 0.261 | |
| 62 | | | | | Theta hat (MLE) | 4.983 | | | | Theta star (bias corrected MLE) | 5.154 | |
| 63 | | | | | nu hat (MLE) | 8.631 | | | | nu star (bias corrected) | 8.346 | |
| 64 | | | | | Adjusted Level of Significance (β) | 0.0335 | | | | | | |
| 65 | | | | | Approximate Chi Square Value (8.35, α) | 2.937 | | | | Adjusted Chi Square Value (8.35, β) | 2.583 | |
| 66 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 3.82 | | | | 95% Gamma Adjusted UCL (use when n<50) | 4.342 | |
| 67 | | | | | | | | | | | | |
| 68 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 69 | | | | | Mean (KM) | 1.344 | | | | SD (KM) | 4.568 | |
| 70 | | | | | Variance (KM) | 20.87 | | | | SE of Mean (KM) | 1.182 | |
| 71 | | | | | k hat (KM) | 0.0865 | | | | k star (KM) | 0.112 | |
| 72 | | | | | nu hat (KM) | 2.769 | | | | nu star (KM) | 3.583 | |
| 73 | | | | | theta hat (KM) | 15.53 | | | | theta star (KM) | 12 | |
| 74 | | | | | 80% gamma percentile (KM) | 1.085 | | | | 90% gamma percentile (KM) | 3.728 | |
| 75 | | | | | 95% gamma percentile (KM) | 7.728 | | | | 99% gamma percentile (KM) | 20.16 | |
| 76 | | | | | | | | | | | | |
| 77 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 78 | | | | | Approximate Chi Square Value (3.58, α) | 0.564 | | | | Adjusted Chi Square Value (3.58, β) | 0.449 | |
| 79 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 8.533 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 10.72 | |
| 80 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 81 | | | | | | | | | | | | |
| 82 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 83 | | | | | Shapiro Wilk Test Statistic | 0.868 | | | | **Shapiro Wilk GOF Test** | | |
| 84 | | | | | 5% Shapiro Wilk Critical Value | 0.881 | | | | Detected Data Not Lognormal at 5% Significance Level | | |
| 85 | | | | | Lilliefors Test Statistic | 0.219 | | | | **Lilliefors GOF Test** | | |
| 86 | | | | | 5% Lilliefors Critical Value | 0.22 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 87 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 88 | | | | | | | | | | | | |
| 89 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 90 | | | | | Mean in Original Scale | 1.344 | | | | Mean in Log Scale | -2.419 | |
| 91 | | | | | SD in Original Scale | 4.718 | | | | SD in Log Scale | 2.085 | |
| 92 | | | | | 95% t UCL (assumes normality of ROS data) | 3.411 | | | | 95% Percentile Bootstrap UCL | 3.699 | |
| 93 | | | | | 95% BCA Bootstrap UCL | 4.872 | | | | 95% Bootstrap t UCL | 74.5 | |
| 94 | | | | | 95% H-UCL (Log ROS) | 9.48 | | | | | | |
| 95 | | | | | | | | | | | | |
| 96 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 97 | | | | | KM Mean (logged) | -2.395 | | | | KM Geo Mean | 0.0912 | |
| 98 | | | | | KM SD (logged) | 1.973 | | | | 95% Critical H Value (KM-Log) | 4.419 | |
| 99 | | | | | KM Standard Error of Mean (logged) | 0.511 | | | | 95% H-UCL (KM -Log) | 6.064 | |
| 100 | | | | | KM SD (logged) | 1.973 | | | | 95% Critical H Value (KM-Log) | 4.419 | |
| 101 | | | | | KM Standard Error of Mean (logged) | 0.511 | | | | | | |
| 102 | | | | | | | | | | | | |
| 103 | **DL/2 Statistics** | | | | | | | | | | | |
| 104 | **DL/2 Normal** | | | | | | | | | **DL/2 Log-Transformed** | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | | | | Mean in Original Scale | 1.344 | | | | | Mean in Log Scale | -2.438 | |
| 106 | | | | SD in Original Scale | 4.718 | | | | | SD in Log Scale | 2.126 | |
| 107 | | | | 95% t UCL (Assumes normality) | 3.411 | | | | | 95% H-Stat UCL | 11.09 | |
| 108 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 109 | | | | | | | | | | | | |
| 110 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 111 | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 112 | | | | | | | | | | | | |
| 113 | **Suggested UCL to Use** | | | | | | | | | | | |
| 114 | | | | 97.5% KM (Chebyshev) UCL | 8.726 | | | | | 99% KM (Chebyshev) UCL | 13.1 | |
| 115 | | | | | | | | | | | | |
| 116 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 117 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 118 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 119 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 120 | | | | | | | | | | | | |
| 121 | **Benzo[a]pyrene** | | | | | | | | | | | |
| 122 | | | | | | | | | | | | |
| 123 | **General Statistics** | | | | | | | | | | | |
| 124 | | | | Total Number of Observations | 16 | | | | | Number of Distinct Observations | 15 | |
| 125 | | | | Number of Detects | 15 | | | | | Number of Non-Detects | 1 | |
| 126 | | | | Number of Distinct Detects | 14 | | | | | Number of Distinct Non-Detects | 1 | |
| 127 | | | | Minimum Detect | 0.01 | | | | | Minimum Non-Detect | 0.0024 | |
| 128 | | | | Maximum Detect | 17 | | | | | Maximum Non-Detect | 0.0024 | |
| 129 | | | | Variance Detects | 18.97 | | | | | Percent Non-Detects | 6.25% | |
| 130 | | | | Mean Detects | 1.276 | | | | | SD Detects | 4.355 | |
| 131 | | | | Median Detects | 0.098 | | | | | CV Detects | 3.414 | |
| 132 | | | | Skewness Detects | 3.857 | | | | | Kurtosis Detects | 14.91 | |
| 133 | | | | Mean of Logged Detects | -2.151 | | | | | SD of Logged Detects | 1.777 | |
| 134 | | | | | | | | | | | | |
| 135 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 136 | | | | Shapiro Wilk Test Statistic | 0.315 | | | | | **Shapiro Wilk GOF Test** | | |
| 137 | | | | 5% Shapiro Wilk Critical Value | 0.881 | | | | | Detected Data Not Normal at 5% Significance Level | | |
| 138 | | | | Lilliefors Test Statistic | 0.47 | | | | | **Lilliefors GOF Test** | | |
| 139 | | | | 5% Lilliefors Critical Value | 0.22 | | | | | Detected Data Not Normal at 5% Significance Level | | |
| 140 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 141 | | | | | | | | | | | | |
| 142 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 143 | | | | KM Mean | 1.196 | | | | | KM Standard Error of Mean | 1.057 | |
| 144 | | | | KM SD | 4.086 | | | | | 95% KM (BCA) UCL | 3.307 | |
| 145 | | | | 95% KM (t) UCL | 3.05 | | | | | 95% KM (Percentile Bootstrap) UCL | 3.281 | |
| 146 | | | | 95% KM (z) UCL | 2.935 | | | | | 95% KM Bootstrap t UCL | 63.84 | |
| 147 | | | | 90% KM Chebyshev UCL | 4.368 | | | | | 95% KM Chebyshev UCL | 5.805 | |
| 148 | | | | 97.5% KM Chebyshev UCL | 7.799 | | | | | 99% KM Chebyshev UCL | 11.72 | |
| 149 | | | | | | | | | | | | |
| 150 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 151 | | | | A-D Test Statistic | 2.669 | | | | | **Anderson-Darling GOF Test** | | |
| 152 | | | | 5% A-D Critical Value | 0.84 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 153 | | | | K-S Test Statistic | 0.37 | | | | | **Kolmogorov-Smirnov GOF** | | |
| 154 | | | | 5% K-S Critical Value | 0.241 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 155 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 156 | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 157 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 158 | | | | | k hat (MLE) | 0.29 | | | k star (bias corrected MLE) | 0.276 | | |
| 159 | | | | | Theta hat (MLE) | 4.405 | | | Theta star (bias corrected MLE) | 4.62 | | |
| 160 | | | | | nu hat (MLE) | 8.688 | | | nu star (bias corrected) | 8.284 | | |
| 161 | | | | | Mean (detects) | 1.276 | | | | | | |
| 162 | | | | | | | | | | | | |
| 163 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 164 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 165 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 166 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 167 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 168 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 169 | | | | | Minimum | 0.01 | | | Mean | 1.197 | | |
| 170 | | | | | Maximum | 17 | | | Median | 0.0905 | | |
| 171 | | | | | SD | 4.219 | | | CV | 3.526 | | |
| 172 | | | | | k hat (MLE) | 0.281 | | | k star (bias corrected MLE) | 0.27 | | |
| 173 | | | | | Theta hat (MLE) | 4.264 | | | Theta star (bias corrected MLE) | 4.438 | | |
| 174 | | | | | nu hat (MLE) | 8.98 | | | nu star (bias corrected) | 8.629 | | |
| 175 | | | | | Adjusted Level of Significance (β) | 0.0335 | | | | | | |
| 176 | | | | | Approximate Chi Square Value (8.63, α) | 3.105 | | | Adjusted Chi Square Value (8.63, β) | 2.739 | | |
| 177 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 3.326 | | | 95% Gamma Adjusted UCL (use when n<50) | 3.77 | | |
| 178 | | | | | | | | | | | | |
| 179 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 180 | | | | | Mean (KM) | 1.196 | | | SD (KM) | 4.086 | | |
| 181 | | | | | Variance (KM) | 16.69 | | | SE of Mean (KM) | 1.057 | | |
| 182 | | | | | k hat (KM) | 0.0857 | | | k star (KM) | 0.111 | | |
| 183 | | | | | nu hat (KM) | 2.743 | | | nu star (KM) | 3.562 | | |
| 184 | | | | | theta hat (KM) | 13.95 | | | theta star (KM) | 10.75 | | |
| 185 | | | | | 80% gamma percentile (KM) | 0.959 | | | 90% gamma percentile (KM) | 3.313 | | |
| 186 | | | | | 95% gamma percentile (KM) | 6.884 | | | 99% gamma percentile (KM) | 18 | | |
| 187 | | | | | | | | | | | | |
| 188 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 189 | | | | | Approximate Chi Square Value (3.56, α) | 0.557 | | | Adjusted Chi Square Value (3.56, β) | 0.443 | | |
| 190 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 7.653 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 9.621 | | |
| 191 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 192 | | | | | | | | | | | | |
| 193 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 194 | | | | | Shapiro Wilk Test Statistic | 0.864 | | | **Shapiro Wilk GOF Test** | | | |
| 195 | | | | | 5% Shapiro Wilk Critical Value | 0.881 | | | Detected Data Not Lognormal at 5% Significance Level | | | |
| 196 | | | | | Lilliefors Test Statistic | 0.215 | | | **Lilliefors GOF Test** | | | |
| 197 | | | | | 5% Lilliefors Critical Value | 0.22 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 198 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 199 | | | | | | | | | | | | |
| 200 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 201 | | | | | Mean in Original Scale | 1.196 | | | Mean in Log Scale | -2.405 | | |
| 202 | | | | | SD in Original Scale | 4.22 | | | SD in Log Scale | 1.995 | | |
| 203 | | | | | 95% t UCL (assumes normality of ROS data) | 3.045 | | | 95% Percentile Bootstrap UCL | 3.292 | | |
| 204 | | | | | 95% BCA Bootstrap UCL | 4.417 | | | 95% Bootstrap t UCL | 63.6 | | |
| 205 | | | | | 95% H-UCL (Log ROS) | 6.568 | | | | | | |
| 206 | | | | | | | | | | | | |
| 207 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 208 | | | | | KM Mean (logged) | -2.394 | | | KM Geo Mean | 0.0913 | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 209 | | | | | KM SD (logged) | 1.909 | | | | 95% Critical H Value (KM-Log) | | 4.298 |
| 210 | | | | | KM Standard Error of Mean (logged) | 0.494 | | | | 95% H-UCL (KM -Log) | | 4.703 |
| 211 | | | | | KM SD (logged) | 1.909 | | | | 95% Critical H Value (KM-Log) | | 4.298 |
| 212 | | | | | KM Standard Error of Mean (logged) | 0.494 | | | | | | |
| 213 | | | | | | | | | | | | |
| 214 | **DL/2 Statistics** | | | | | | | | | | | |
| 215 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 216 | | | | | Mean in Original Scale | 1.196 | | | | Mean in Log Scale | | -2.437 |
| 217 | | | | | SD in Original Scale | 4.22 | | | | SD in Log Scale | | 2.063 |
| 218 | | | | | 95% t UCL (Assumes normality) | 3.045 | | | | 95% H-Stat UCL | | 8.456 |
| 219 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 220 | | | | | | | | | | | | |
| 221 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 222 | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 223 | | | | | | | | | | | | |
| 224 | **Suggested UCL to Use** | | | | | | | | | | | |
| 225 | | | | | 97.5% KM (Chebyshev) UCL | 7.799 | | | | 99% KM (Chebyshev) UCL | | 11.72 |
| 226 | | | | | | | | | | | | |
| 227 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 228 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 229 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 230 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 231 | | | | | | | | | | | | |
| 232 | **Benzo[b]fluoranthene** | | | | | | | | | | | |
| 233 | | | | | | | | | | | | |
| 234 | **General Statistics** | | | | | | | | | | | |
| 235 | | | | | Total Number of Observations | 16 | | | | Number of Distinct Observations | | 16 |
| 236 | | | | | Number of Detects | 15 | | | | Number of Non-Detects | | 1 |
| 237 | | | | | Number of Distinct Detects | 15 | | | | Number of Distinct Non-Detects | | 1 |
| 238 | | | | | Minimum Detect | 0.016 | | | | Minimum Non-Detect | | 0.0024 |
| 239 | | | | | Maximum Detect | 23 | | | | Maximum Non-Detect | | 0.0024 |
| 240 | | | | | Variance Detects | 34.68 | | | | Percent Non-Detects | | 6.25% |
| 241 | | | | | Mean Detects | 1.741 | | | | SD Detects | | 5.889 |
| 242 | | | | | Median Detects | 0.14 | | | | CV Detects | | 3.383 |
| 243 | | | | | Skewness Detects | 3.855 | | | | Kurtosis Detects | | 14.9 |
| 244 | | | | | Mean of Logged Detects | -1.77 | | | | SD of Logged Detects | | 1.75 |
| 245 | | | | | | | | | | | | |
| 246 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 247 | | | | | Shapiro Wilk Test Statistic | 0.317 | **Shapiro Wilk GOF Test** | | | | | |
| 248 | | | | | 5% Shapiro Wilk Critical Value | 0.881 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 249 | | | | | Lilliefors Test Statistic | 0.466 | **Lilliefors GOF Test** | | | | | |
| 250 | | | | | 5% Lilliefors Critical Value | 0.22 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 251 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 252 | | | | | | | | | | | | |
| 253 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 254 | | | | | KM Mean | 1.632 | | | | KM Standard Error of Mean | | 1.43 |
| 255 | | | | | KM SD | 5.525 | | | | 95% KM (BCA) UCL | | 4.477 |
| 256 | | | | | 95% KM (t) UCL | 4.138 | | | | 95% KM (Percentile Bootstrap) UCL | | 4.431 |
| 257 | | | | | 95% KM (z) UCL | 3.984 | | | | 95% KM Bootstrap t UCL | | 79.26 |
| 258 | | | | | 90% KM Chebyshev UCL | 5.921 | | | | 95% KM Chebyshev UCL | | 7.864 |
| 259 | | | | | 97.5% KM Chebyshev UCL | 10.56 | | | | 99% KM Chebyshev UCL | | 15.86 |
| 260 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 262 | | | | | A-D Test Statistic | 2.625 | **Anderson-Darling GOF Test** | | | | | |
| 263 | | | | | 5% A-D Critical Value | 0.837 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 264 | | | | | K-S Test Statistic | 0.368 | **Kolmogorov-Smirnov GOF** | | | | | |
| 265 | | | | | 5% K-S Critical Value | 0.24 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 266 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 267 | | | | | | | | | | | | |
| 268 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 269 | | | | | k hat (MLE) | 0.297 | | | k star (bias corrected MLE) | | | 0.282 |
| 270 | | | | | Theta hat (MLE) | 5.858 | | | Theta star (bias corrected MLE) | | | 6.169 |
| 271 | | | | | nu hat (MLE) | 8.914 | | | nu star (bias corrected) | | | 8.464 |
| 272 | | | | | Mean (detects) | 1.741 | | | | | | |
| 273 | | | | | | | | | | | | |
| 274 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 275 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 276 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 277 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 278 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 279 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 280 | | | | | Minimum | 0.01 | | | Mean | | | 1.632 |
| 281 | | | | | Maximum | 23 | | | Median | | | 0.13 |
| 282 | | | | | SD | 5.706 | | | CV | | | 3.495 |
| 283 | | | | | k hat (MLE) | 0.285 | | | k star (bias corrected MLE) | | | 0.273 |
| 284 | | | | | Theta hat (MLE) | 5.723 | | | Theta star (bias corrected MLE) | | | 5.97 |
| 285 | | | | | nu hat (MLE) | 9.128 | | | nu star (bias corrected) | | | 8.75 |
| 286 | | | | | Adjusted Level of Significance (β) | 0.0335 | | | | | | |
| 287 | | | | | Approximate Chi Square Value (8.75, α) | 3.176 | | | Adjusted Chi Square Value (8.75, β) | | | 2.806 |
| 288 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 4.497 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 5.091 |
| 289 | | | | | | | | | | | | |
| 290 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 291 | | | | | Mean (KM) | 1.632 | | | SD (KM) | | | 5.525 |
| 292 | | | | | Variance (KM) | 30.53 | | | SE of Mean (KM) | | | 1.43 |
| 293 | | | | | k hat (KM) | 0.0872 | | | k star (KM) | | | 0.113 |
| 294 | | | | | nu hat (KM) | 2.792 | | | nu star (KM) | | | 3.602 |
| 295 | | | | | theta hat (KM) | 18.7 | | | theta star (KM) | | | 14.5 |
| 296 | | | | | 80% gamma percentile (KM) | 1.327 | | | 90% gamma percentile (KM) | | | 4.536 |
| 297 | | | | | 95% gamma percentile (KM) | 9.382 | | | 99% gamma percentile (KM) | | | 24.42 |
| 298 | | | | | | | | | | | | |
| 299 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 300 | | | | | Approximate Chi Square Value (3.60, α) | 0.571 | | | Adjusted Chi Square Value (3.60, β) | | | 0.455 |
| 301 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 10.29 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 12.92 |
| 302 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 303 | | | | | | | | | | | | |
| 304 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 305 | | | | | Shapiro Wilk Test Statistic | 0.866 | **Shapiro Wilk GOF Test** | | | | | |
| 306 | | | | | 5% Shapiro Wilk Critical Value | 0.881 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 307 | | | | | Lilliefors Test Statistic | 0.213 | **Lilliefors GOF Test** | | | | | |
| 308 | | | | | 5% Lilliefors Critical Value | 0.22 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 309 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 310 | | | | | | | | | | | | |
| 311 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 312 | | | | | Mean in Original Scale | 1.632 | | | Mean in Log Scale | | | -2.021 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 313 | | | | SD in Original Scale | 5.706 | | | | | SD in Log Scale | 1.966 | |
| 314 | | | 95% t UCL (assumes normality of ROS data) | | 4.133 | | | | | 95% Percentile Bootstrap UCL | 4.431 | |
| 315 | | | | 95% BCA Bootstrap UCL | 5.978 | | | | | 95% Bootstrap t UCL | 79.2 | |
| 316 | | | | 95% H-UCL (Log ROS) | 8.565 | | | | | | | |
| 317 | | | | | | | | | | | | |
| 318 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 319 | | | | KM Mean (logged) | -2.037 | | | | | KM Geo Mean | 0.13 | |
| 320 | | | | KM SD (logged) | 1.935 | | | | | 95% Critical H Value (KM-Log) | 4.346 | |
| 321 | | | KM Standard Error of Mean (logged) | | 0.501 | | | | | 95% H-UCL (KM -Log) | 7.442 | |
| 322 | | | | KM SD (logged) | 1.935 | | | | | 95% Critical H Value (KM-Log) | 4.346 | |
| 323 | | | KM Standard Error of Mean (logged) | | 0.501 | | | | | | | |
| 324 | | | | | | | | | | | | |
| 325 | **DL/2 Statistics** | | | | | | | | | | | |
| 326 | **DL/2 Normal** | | | | | | | | | **DL/2 Log-Transformed** | | |
| 327 | | | | Mean in Original Scale | 1.632 | | | | | Mean in Log Scale | -2.08 | |
| 328 | | | | SD in Original Scale | 5.706 | | | | | SD in Log Scale | 2.096 | |
| 329 | | | 95% t UCL (Assumes normality) | | 4.133 | | | | | 95% H-Stat UCL | 13.94 | |
| 330 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 331 | | | | | | | | | | | | |
| 332 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 333 | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 334 | | | | | | | | | | | | |
| 335 | **Suggested UCL to Use** | | | | | | | | | | | |
| 336 | | | | 97.5% KM (Chebyshev) UCL | 10.56 | | | | | 99% KM (Chebyshev) UCL | 15.86 | |
| 337 | | | | | | | | | | | | |
| 338 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 339 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 340 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 341 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 342 | | | | | | | | | | | | |
| 343 | **Dibenz(a,h)anthracene** | | | | | | | | | | | |
| 344 | | | | | | | | | | | | |
| 345 | **General Statistics** | | | | | | | | | | | |
| 346 | | | | Total Number of Observations | 16 | | | | | Number of Distinct Observations | 15 | |
| 347 | | | | Number of Detects | 15 | | | | | Number of Non-Detects | 1 | |
| 348 | | | | Number of Distinct Detects | 14 | | | | | Number of Distinct Non-Detects | 1 | |
| 349 | | | | Minimum Detect | 0.0021 | | | | | Minimum Non-Detect | 0.0024 | |
| 350 | | | | Maximum Detect | 3 | | | | | Maximum Non-Detect | 0.0024 | |
| 351 | | | | Variance Detects | 0.59 | | | | | Percent Non-Detects | 6.25% | |
| 352 | | | | Mean Detects | 0.226 | | | | | SD Detects | 0.768 | |
| 353 | | | | Median Detects | 0.019 | | | | | CV Detects | 3.398 | |
| 354 | | | | Skewness Detects | 3.856 | | | | | Kurtosis Detects | 14.91 | |
| 355 | | | | Mean of Logged Detects | -3.822 | | | | | SD of Logged Detects | 1.737 | |
| 356 | | | | | | | | | | | | |
| 357 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 358 | | | | Shapiro Wilk Test Statistic | 0.315 | | | | | **Shapiro Wilk GOF Test** | | |
| 359 | | | | 5% Shapiro Wilk Critical Value | 0.881 | | | | | Detected Data Not Normal at 5% Significance Level | | |
| 360 | | | | Lilliefors Test Statistic | 0.468 | | | | | **Lilliefors GOF Test** | | |
| 361 | | | | 5% Lilliefors Critical Value | 0.22 | | | | | Detected Data Not Normal at 5% Significance Level | | |
| 362 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 363 | | | | | | | | | | | | |
| 364 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 365 | | | | | KM Mean | 0.212 | | | | KM Standard Error of Mean | | 0.187 |
| 366 | | | | | KM SD | 0.721 | | | | 95% KM (BCA) UCL | | 0.587 |
| 367 | | | | | 95% KM (t) UCL | 0.539 | | | | 95% KM (Percentile Bootstrap) UCL | | 0.582 |
| 368 | | | | | 95% KM (z) UCL | 0.519 | | | | 95% KM Bootstrap t UCL | | 11.27 |
| 369 | | | | | 90% KM Chebyshev UCL | 0.772 | | | | 95% KM Chebyshev UCL | | 1.025 |
| 370 | | | | | 97.5% KM Chebyshev UCL | 1.377 | | | | 99% KM Chebyshev UCL | | 2.068 |
| 371 | | | | | | | | | | | | |
| 372 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 373 | | | | | A-D Test Statistic | 2.705 | **Anderson-Darling GOF Test** | | | | | |
| 374 | | | | | 5% A-D Critical Value | 0.837 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 375 | | | | | K-S Test Statistic | 0.381 | **Kolmogorov-Smirnov GOF** | | | | | |
| 376 | | | | | 5% K-S Critical Value | 0.24 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 377 | | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 378 | | | | | | | | | | | | |
| 379 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 380 | | | | | k hat (MLE) | 0.296 | k star (bias corrected MLE) | | | | | 0.281 |
| 381 | | | | | Theta hat (MLE) | 0.764 | Theta star (bias corrected MLE) | | | | | 0.804 |
| 382 | | | | | nu hat (MLE) | 8.879 | nu star (bias corrected) | | | | | 8.437 |
| 383 | | | | | Mean (detects) | 0.226 | | | | | | |
| 384 | | | | | | | | | | | | |
| 385 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 386 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 387 | | | | | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | |
| 388 | | | | | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | |
| 389 | | | | | This is especially true when the sample size is small. | | | | | | | |
| 390 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 391 | | | | | Minimum | 0.0021 | Mean | | | | | 0.213 |
| 392 | | | | | Maximum | 3 | Median | | | | | 0.017 |
| 393 | | | | | SD | 0.744 | CV | | | | | 3.501 |
| 394 | | | | | k hat (MLE) | 0.297 | k star (bias corrected MLE) | | | | | 0.283 |
| 395 | | | | | Theta hat (MLE) | 0.715 | Theta star (bias corrected MLE) | | | | | 0.751 |
| 396 | | | | | nu hat (MLE) | 9.515 | nu star (bias corrected) | | | | | 9.064 |
| 397 | | | | | Adjusted Level of Significance (β) | 0.0335 | | | | | | |
| 398 | | | | | Approximate Chi Square Value (9.06, α) | 3.366 | Adjusted Chi Square Value (9.06, β) | | | | | 2.982 |
| 399 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.573 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.646 |
| 400 | | | | | | | | | | | | |
| 401 | | | | | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | |
| 402 | | | | | Mean (KM) | 0.212 | SD (KM) | | | | | 0.721 |
| 403 | | | | | Variance (KM) | 0.519 | SE of Mean (KM) | | | | | 0.187 |
| 404 | | | | | k hat (KM) | 0.0866 | k star (KM) | | | | | 0.112 |
| 405 | | | | | nu hat (KM) | 2.771 | nu star (KM) | | | | | 3.585 |
| 406 | | | | | theta hat (KM) | 2.449 | theta star (KM) | | | | | 1.893 |
| 407 | | | | | 80% gamma percentile (KM) | 0.171 | 90% gamma percentile (KM) | | | | | 0.589 |
| 408 | | | | | 95% gamma percentile (KM) | 1.22 | 99% gamma percentile (KM) | | | | | 3.181 |
| 409 | | | | | | | | | | | | |
| 410 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 411 | | | | | Approximate Chi Square Value (3.59, α) | 0.565 | Adjusted Chi Square Value (3.59, β) | | | | | 0.45 |
| 412 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 1.346 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 1.691 |
| 413 | | | | | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | |
| 414 | | | | | | | | | | | | |
| 415 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 416 | | | | | Shapiro Wilk Test Statistic | 0.856 | **Shapiro Wilk GOF Test** | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 417 | 5% Shapiro Wilk Critical Value | | | | | 0.881 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 418 | Lilliefors Test Statistic | | | | | 0.236 | **Lilliefors GOF Test** | | | | | |
| 419 | 5% Lilliefors Critical Value | | | | | 0.22 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 420 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 421 | | | | | | | | | | | | |
| 422 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 423 | Mean in Original Scale | | | | | 0.212 | Mean in Log Scale | | | | | -4.013 |
| 424 | SD in Original Scale | | | | | 0.744 | SD in Log Scale | | | | | 1.844 |
| 425 | 95% t UCL (assumes normality of ROS data) | | | | | 0.538 | 95% Percentile Bootstrap UCL | | | | | 0.581 |
| 426 | 95% BCA Bootstrap UCL | | | | | 0.771 | 95% Bootstrap t UCL | | | | | 11.3 |
| 427 | 95% H-UCL (Log ROS) | | | | | 0.724 | | | | | | |
| 428 | | | | | | | | | | | | |
| 429 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 430 | KM Mean (logged) | | | | | -3.968 | KM Geo Mean | | | | | 0.0189 |
| 431 | KM SD (logged) | | | | | 1.721 | 95% Critical H Value (KM-Log) | | | | | 3.947 |
| 432 | KM Standard Error of Mean (logged) | | | | | 0.445 | 95% H-UCL (KM -Log) | | | | | 0.481 |
| 433 | KM SD (logged) | | | | | 1.721 | 95% Critical H Value (KM-Log) | | | | | 3.947 |
| 434 | KM Standard Error of Mean (logged) | | | | | 0.445 | | | | | | |
| 435 | | | | | | | | | | | | |
| 436 | **DL/2 Statistics** | | | | | | | | | | | |
| 437 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 438 | Mean in Original Scale | | | | | 0.212 | Mean in Log Scale | | | | | -4.003 |
| 439 | SD in Original Scale | | | | | 0.744 | SD in Log Scale | | | | | 1.829 |
| 440 | 95% t UCL (Assumes normality) | | | | | 0.538 | 95% H-Stat UCL | | | | | 0.689 |
| 441 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 442 | | | | | | | | | | | | |
| 443 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 444 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 445 | | | | | | | | | | | | |
| 446 | **Suggested UCL to Use** | | | | | | | | | | | |
| 447 | 975% KM (Chebyshev) UCL | | | | | 1.377 | | | | | | |
| 448 | | | | | | | | | | | | |
| 449 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 450 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 451 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 452 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 453 | | | | | | | | | | | | |
| 454 | **Indeno[1,2,3-cd]pyrene** | | | | | | | | | | | |
| 455 | | | | | | | | | | | | |
| 456 | **General Statistics** | | | | | | | | | | | |
| 457 | Total Number of Observations | | | | | 16 | Number of Distinct Observations | | | | | 16 |
| 458 | Number of Detects | | | | | 15 | Number of Non-Detects | | | | | 1 |
| 459 | Number of Distinct Detects | | | | | 15 | Number of Distinct Non-Detects | | | | | 1 |
| 460 | Minimum Detect | | | | | 0.0073 | Minimum Non-Detect | | | | | 0.0024 |
| 461 | Maximum Detect | | | | | 8.4 | Maximum Non-Detect | | | | | 0.0024 |
| 462 | Variance Detects | | | | | 4.627 | Percent Non-Detects | | | | | 6.25% |
| 463 | Mean Detects | | | | | 0.632 | SD Detects | | | | | 2.151 |
| 464 | Median Detects | | | | | 0.054 | CV Detects | | | | | 3.402 |
| 465 | Skewness Detects | | | | | 3.86 | Kurtosis Detects | | | | | 14.93 |
| 466 | Mean of Logged Detects | | | | | -2.736 | SD of Logged Detects | | | | | 1.693 |
| 467 | | | | | | | | | | | | |
| 468 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 469 | | | | | Shapiro Wilk Test Statistic | 0.313 | **Shapiro Wilk GOF Test** | | | | | |
| 470 | | | | | 5% Shapiro Wilk Critical Value | 0.881 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 471 | | | | | Lilliefors Test Statistic | 0.478 | **Lilliefors GOF Test** | | | | | |
| 472 | | | | | 5% Lilliefors Critical Value | 0.22 | Detected Data Not Normal at 5% Significance Level | | | | | |
| 473 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 474 | | | | | | | | | | | | |
| 475 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 476 | | | | | KM Mean | 0.593 | KM Standard Error of Mean | | | | | 0.522 |
| 477 | | | | | KM SD | 2.018 | 95% KM (BCA) UCL | | | | | 1.64 |
| 478 | | | | | 95% KM (t) UCL | 1.508 | 95% KM (Percentile Bootstrap) UCL | | | | | 1.618 |
| 479 | | | | | 95% KM (z) UCL | 1.452 | 95% KM Bootstrap t UCL | | | | | 29.87 |
| 480 | | | | | 90% KM Chebyshev UCL | 2.159 | 95% KM Chebyshev UCL | | | | | 2.869 |
| 481 | | | | | 97.5% KM Chebyshev UCL | 3.854 | 99% KM Chebyshev UCL | | | | | 5.788 |
| 482 | | | | | | | | | | | | |
| 483 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 484 | | | | | A-D Test Statistic | 2.744 | **Anderson-Darling GOF Test** | | | | | |
| 485 | | | | | 5% A-D Critical Value | 0.835 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 486 | | | | | K-S Test Statistic | 0.374 | **Kolmogorov-Smirnov GOF** | | | | | |
| 487 | | | | | 5% K-S Critical Value | 0.24 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 488 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 489 | | | | | | | | | | | | |
| 490 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 491 | | | | | k hat (MLE) | 0.302 | k star (bias corrected MLE) | | | | | 0.286 |
| 492 | | | | | Theta hat (MLE) | 2.091 | Theta star (bias corrected MLE) | | | | | 2.208 |
| 493 | | | | | nu hat (MLE) | 9.07 | nu star (bias corrected) | | | | | 8.589 |
| 494 | | | | | Mean (detects) | 0.632 | | | | | | |
| 495 | | | | | | | | | | | | |
| 496 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 497 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 498 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 499 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 500 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 501 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 502 | | | | | Minimum | 0.0073 | Mean | | | | | 0.593 |
| 503 | | | | | Maximum | 8.4 | Median | | | | | 0.051 |
| 504 | | | | | SD | 2.084 | CV | | | | | 3.512 |
| 505 | | | | | k hat (MLE) | 0.296 | k star (bias corrected MLE) | | | | | 0.282 |
| 506 | | | | | Theta hat (MLE) | 2.002 | Theta star (bias corrected MLE) | | | | | 2.1 |
| 507 | | | | | nu hat (MLE) | 9.484 | nu star (bias corrected) | | | | | 9.039 |
| 508 | | | | | Adjusted Level of Significance (β) | 0.0335 | | | | | | |
| 509 | | | | | Approximate Chi Square Value (9.04, α) | 3.351 | Adjusted Chi Square Value (9.04, β) | | | | | 2.967 |
| 510 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.601 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 1.807 |
| 511 | | | | | | | | | | | | |
| 512 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 513 | | | | | Mean (KM) | 0.593 | SD (KM) | | | | | 2.018 |
| 514 | | | | | Variance (KM) | 4.072 | SE of Mean (KM) | | | | | 0.522 |
| 515 | | | | | k hat (KM) | 0.0863 | k star (KM) | | | | | 0.112 |
| 516 | | | | | nu hat (KM) | 2.762 | nu star (KM) | | | | | 3.577 |
| 517 | | | | | theta hat (KM) | 6.868 | theta star (KM) | | | | | 5.303 |
| 518 | | | | | 80% gamma percentile (KM) | 0.478 | 90% gamma percentile (KM) | | | | | 1.644 |
| 519 | | | | | 95% gamma percentile (KM) | 3.41 | 99% gamma percentile (KM) | | | | | 8.9 |
| 520 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 521 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 522 | Approximate Chi Square Value (3.58, α) | | | | | 0.562 | Adjusted Chi Square Value (3.58, β) | | | | | 0.447 |
| 523 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 3.772 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 4.74 |
| 524 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 525 | | | | | | | | | | | | |
| 526 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 527 | Shapiro Wilk Test Statistic | | | | | 0.849 | **Shapiro Wilk GOF Test** | | | | | |
| 528 | 5% Shapiro Wilk Critical Value | | | | | 0.881 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 529 | Lilliefors Test Statistic | | | | | 0.223 | **Lilliefors GOF Test** | | | | | |
| 530 | 5% Lilliefors Critical Value | | | | | 0.22 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 531 | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 532 | | | | | | | | | | | | |
| 533 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 534 | Mean in Original Scale | | | | | 0.593 | Mean in Log Scale | | | | | -2.977 |
| 535 | SD in Original Scale | | | | | 2.084 | SD in Log Scale | | | | | 1.897 |
| 536 | 95% t UCL (assumes normality of ROS data) | | | | | 1.506 | 95% Percentile Bootstrap UCL | | | | | 1.624 |
| 537 | 95% BCA Bootstrap UCL | | | | | 2.181 | 95% Bootstrap t UCL | | | | | 29.7 |
| 538 | 95% H-UCL (Log ROS) | | | | | 2.498 | | | | | | |
| 539 | | | | | | | | | | | | |
| 540 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 541 | KM Mean (logged) | | | | | -2.942 | KM Geo Mean | | | | | 0.0527 |
| 542 | KM SD (logged) | | | | | 1.773 | 95% Critical H Value (KM-Log) | | | | | 4.043 |
| 543 | KM Standard Error of Mean (logged) | | | | | 0.459 | 95% H-UCL (KM -Log) | | | | | 1.616 |
| 544 | KM SD (logged) | | | | | 1.773 | 95% Critical H Value (KM-Log) | | | | | 4.043 |
| 545 | KM Standard Error of Mean (logged) | | | | | 0.459 | | | | | | |
| 546 | | | | | | | | | | | | |
| 547 | **DL/2 Statistics** | | | | | | | | | | | |
| 548 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 549 | Mean in Original Scale | | | | | 0.593 | Mean in Log Scale | | | | | -2.986 |
| 550 | SD in Original Scale | | | | | 2.084 | SD in Log Scale | | | | | 1.915 |
| 551 | 95% t UCL (Assumes normality) | | | | | 1.506 | 95% H-Stat UCL | | | | | 2.664 |
| 552 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 553 | | | | | | | | | | | | |
| 554 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 555 | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 556 | | | | | | | | | | | | |
| 557 | **Suggested UCL to Use** | | | | | | | | | | | |
| 558 | 975% KM (Chebyshev) UCL | | | | | 3.854 | | | | | | |
| 559 | | | | | | | | | | | | |
| 560 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 561 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 562 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 563 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 564 | | | | | | | | | | | | |
| 565 | **Arochlor 1260** | | | | | | | | | | | |
| 566 | | | | | | | | | | | | |
| 567 | **General Statistics** | | | | | | | | | | | |
| 568 | Total Number of Observations | | | | | 16 | Number of Distinct Observations | | | | | 14 |
| 569 | Number of Detects | | | | | 13 | Number of Non-Detects | | | | | 3 |
| 570 | Number of Distinct Detects | | | | | 11 | Number of Distinct Non-Detects | | | | | 3 |
| 571 | Minimum Detect | | | | | 0.01 | Minimum Non-Detect | | | | | 0.0077 |
| 572 | Maximum Detect | | | | | 0.66 | Maximum Non-Detect | | | | | 0.0086 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 573 | | | | | Variance Detects | 0.0311 | | | | | Percent Non-Detects | 18.75% |
| 574 | | | | | Mean Detects | 0.103 | | | | | SD Detects | 0.176 |
| 575 | | | | | Median Detects | 0.05 | | | | | CV Detects | 1.712 |
| 576 | | | | | Skewness Detects | 3.06 | | | | | Kurtosis Detects | 9.858 |
| 577 | | | | | Mean of Logged Detects | -3.05 | | | | | SD of Logged Detects | 1.19 |
| 578 | | | | | | | | | | | | |
| 579 | | | | | **Normal GOF Test on Detects Only** | | | | | | | |
| 580 | | | | | Shapiro Wilk Test Statistic | 0.545 | | | **Shapiro Wilk GOF Test** | | | |
| 581 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 582 | | | | | Lilliefors Test Statistic | 0.378 | | | **Lilliefors GOF Test** | | | |
| 583 | | | | | 5% Lilliefors Critical Value | 0.234 | | | Detected Data Not Normal at 5% Significance Level | | | |
| 584 | | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | |
| 585 | | | | | | | | | | | | |
| 586 | | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | |
| 587 | | | | | KM Mean | 0.0851 | | | KM Standard Error of Mean | | | 0.0409 |
| 588 | | | | | KM SD | 0.157 | | | 95% KM (BCA) UCL | | | 0.161 |
| 589 | | | | | 95% KM (t) UCL | 0.157 | | | 95% KM (Percentile Bootstrap) UCL | | | 0.158 |
| 590 | | | | | 95% KM (z) UCL | 0.152 | | | 95% KM Bootstrap t UCL | | | 0.397 |
| 591 | | | | | 90% KM Chebyshev UCL | 0.208 | | | 95% KM Chebyshev UCL | | | 0.263 |
| 592 | | | | | 97.5% KM Chebyshev UCL | 0.341 | | | 99% KM Chebyshev UCL | | | 0.492 |
| 593 | | | | | | | | | | | | |
| 594 | | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | |
| 595 | | | | | A-D Test Statistic | 0.86 | | | **Anderson-Darling GOF Test** | | | |
| 596 | | | | | 5% A-D Critical Value | 0.769 | | | Detected Data Not Gamma Distributed at 5% Significance Level | | | |
| 597 | | | | | K-S Test Statistic | 0.242 | | | **Kolmogorov-Smirnov GOF** | | | |
| 598 | | | | | 5% K-S Critical Value | 0.246 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 599 | | | | | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | |
| 600 | | | | | | | | | | | | |
| 601 | | | | | **Gamma Statistics on Detected Data Only** | | | | | | | |
| 602 | | | | | k hat (MLE) | 0.768 | | | k star (bias corrected MLE) | | | 0.642 |
| 603 | | | | | Theta hat (MLE) | 0.134 | | | Theta star (bias corrected MLE) | | | 0.16 |
| 604 | | | | | nu hat (MLE) | 19.97 | | | nu star (bias corrected) | | | 16.69 |
| 605 | | | | | Mean (detects) | 0.103 | | | | | | |
| 606 | | | | | | | | | | | | |
| 607 | | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | |
| 608 | | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | |
| 609 | | | | | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | |
| 610 | | | | | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | |
| 611 | | | | | This is especially true when the sample size is small. | | | | | | | |
| 612 | | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | |
| 613 | | | | | Minimum | 0.01 | | | Mean | | | 0.0856 |
| 614 | | | | | Maximum | 0.66 | | | Median | | | 0.031 |
| 615 | | | | | SD | 0.162 | | | CV | | | 1.895 |
| 616 | | | | | k hat (MLE) | 0.686 | | | k star (bias corrected MLE) | | | 0.599 |
| 617 | | | | | Theta hat (MLE) | 0.125 | | | Theta star (bias corrected MLE) | | | 0.143 |
| 618 | | | | | nu hat (MLE) | 21.96 | | | nu star (bias corrected) | | | 19.17 |
| 619 | | | | | Adjusted Level of Significance (β) | 0.0335 | | | | | | |
| 620 | | | | | Approximate Chi Square Value (19.17, α) | 10.25 | | | Adjusted Chi Square Value (19.17, β) | | | 9.508 |
| 621 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.16 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 0.173 |
| 622 | | | | | | | | | | | | |
| 623 | | | | | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | |
| 624 | | | | | Mean (KM) | 0.0851 | | | SD (KM) | | | 0.157 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 625 | | | | | Variance (KM) | 0.0247 | | | | | SE of Mean (KM) | 0.0409 |
| 626 | | | | | k hat (KM) | 0.293 | | | | | k star (KM) | 0.28 |
| 627 | | | | | nu hat (KM) | 9.383 | | | | | nu star (KM) | 8.957 |
| 628 | | | | | theta hat (KM) | 0.29 | | | | | theta star (KM) | 0.304 |
| 629 | | | | | 80% gamma percentile (KM) | 0.128 | | | | | 90% gamma percentile (KM) | 0.253 |
| 630 | | | | | 95% gamma percentile (KM) | 0.398 | | | | | 99% gamma percentile (KM) | 0.778 |
| 631 | | | | | | | | | | | | |
| 632 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 633 | | | | | Approximate Chi Square Value (8.96, α) | 3.301 | | | | | Adjusted Chi Square Value (8.96, β) | 2.921 |
| 634 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.231 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.261 |
| 635 | | | | | | | | | | | | |
| 636 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 637 | | | | | Shapiro Wilk Test Statistic | 0.936 | | | | | **Shapiro Wilk GOF Test** | |
| 638 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 639 | | | | | Lilliefors Test Statistic | 0.15 | | | | | **Lilliefors GOF Test** | |
| 640 | | | | | 5% Lilliefors Critical Value | 0.234 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 641 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 642 | | | | | | | | | | | | |
| 643 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 644 | | | | | Mean in Original Scale | 0.0842 | | | | | Mean in Log Scale | -3.569 |
| 645 | | | | | SD in Original Scale | 0.163 | | | | | SD in Log Scale | 1.541 |
| 646 | | | | | 95% t UCL (assumes normality of ROS data) | 0.156 | | | | | 95% Percentile Bootstrap UCL | 0.159 |
| 647 | | | | | 95% BCA Bootstrap UCL | 0.205 | | | | | 95% Bootstrap t UCL | 0.389 |
| 648 | | | | | 95% H-UCL (Log ROS) | 0.39 | | | | | | |
| 649 | | | | | | | | | | | | |
| 650 | | | | | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | |
| 651 | | | | | KM Mean (logged) | -3.391 | | | | | KM Geo Mean | 0.0337 |
| 652 | | | | | KM SD (logged) | 1.251 | | | | | 95% Critical H Value (KM-Log) | 3.111 |
| 653 | | | | | KM Standard Error of Mean (logged) | 0.326 | | | | | 95% H-UCL (KM -Log) | 0.201 |
| 654 | | | | | KM SD (logged) | 1.251 | | | | | 95% Critical H Value (KM-Log) | 3.111 |
| 655 | | | | | KM Standard Error of Mean (logged) | 0.326 | | | | | | |
| 656 | | | | | | | | | | | | |
| 657 | | | | | **DL/2 Statistics** | | | | | | | |
| 658 | | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | |
| 659 | | | | | Mean in Original Scale | 0.0845 | | | | | Mean in Log Scale | -3.511 |
| 660 | | | | | SD in Original Scale | 0.163 | | | | | SD in Log Scale | 1.454 |
| 661 | | | | | 95% t UCL (Assumes normality) | 0.156 | | | | | 95% H-Stat UCL | 0.315 |
| 662 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 663 | | | | | | | | | | | | |
| 664 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 665 | | | | | **Detected Data appear Approximate Gamma Distributed at 5% Significance Level** | | | | | | | |
| 666 | | | | | | | | | | | | |
| 667 | | | | | **Suggested UCL to Use** | | | | | | | |
| 668 | | | | | Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1) | 0.261 | | | | | | |
| 669 | | | | | | | | | | | | |
| 670 | | | | | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | |
| 671 | | | | | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | |
| 672 | | | | | | | | | | | | |
| 673 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 674 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 675 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 676 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 677 | | | | | | | | | | | | |
| 678 | | | | | | | | | | | | |
| 679 | **Aluminum** | | | | | | | | | | | |
| 680 | | | | | | | | | | | | |
| 681 | **General Statistics** | | | | | | | | | | | |
| 682 | | | | | Total Number of Observations | 16 | | | Number of Distinct Observations | 14 | | |
| 683 | | | | | | | | | Number of Missing Observations | 0 | | |
| 684 | | | | | Minimum | 3700 | | | Mean | 5422 | | |
| 685 | | | | | Maximum | 8600 | | | Median | 5050 | | |
| 686 | | | | | SD | 1451 | | | Std. Error of Mean | 362.7 | | |
| 687 | | | | | Coefficient of Variation | 0.268 | | | Skewness | 0.856 | | |
| 688 | | | | | | | | | | | | |
| 689 | **Normal GOF Test** | | | | | | | | | | | |
| 690 | | | | | Shapiro Wilk Test Statistic | 0.901 | | | **Shapiro Wilk GOF Test** | | | |
| 691 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data appear Normal at 5% Significance Level | | | |
| 692 | | | | | Lilliefors Test Statistic | 0.158 | | | **Lilliefors GOF Test** | | | |
| 693 | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data appear Normal at 5% Significance Level | | | |
| 694 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 695 | | | | | | | | | | | | |
| 696 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 697 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 698 | | | | | 95% Student's-t UCL | 6058 | | | 95% Adjusted-CLT UCL (Chen-1995) | 6101 | | |
| 699 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 6071 | | |
| 700 | | | | | | | | | | | | |
| 701 | **Gamma GOF Test** | | | | | | | | | | | |
| 702 | | | | | A-D Test Statistic | 0.532 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 703 | | | | | 5% A-D Critical Value | 0.737 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 704 | | | | | K-S Test Statistic | 0.167 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | | |
| 705 | | | | | 5% K-S Critical Value | 0.215 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 706 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 707 | | | | | | | | | | | | |
| 708 | **Gamma Statistics** | | | | | | | | | | | |
| 709 | | | | | k hat (MLE) | 16.15 | | | k star (bias corrected MLE) | 13.16 | | |
| 710 | | | | | Theta hat (MLE) | 335.7 | | | Theta star (bias corrected MLE) | 411.9 | | |
| 711 | | | | | nu hat (MLE) | 516.8 | | | nu star (bias corrected) | 421.3 | | |
| 712 | | | | | MLE Mean (bias corrected) | 5422 | | | MLE Sd (bias corrected) | 1494 | | |
| 713 | | | | | | | | | Approximate Chi Square Value (0.05) | 374.7 | | |
| 714 | | | | | Adjusted Level of Significance | 0.0335 | | | Adjusted Chi Square Value | 369.7 | | |
| 715 | | | | | | | | | | | | |
| 716 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 717 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 6096 | | | 95% Adjusted Gamma UCL (use when n<50) | 6178 | | |
| 718 | | | | | | | | | | | | |
| 719 | **Lognormal GOF Test** | | | | | | | | | | | |
| 720 | | | | | Shapiro Wilk Test Statistic | 0.932 | | | **Shapiro Wilk Lognormal GOF Test** | | | |
| 721 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data appear Lognormal at 5% Significance Level | | | |
| 722 | | | | | Lilliefors Test Statistic | 0.16 | | | **Lilliefors Lognormal GOF Test** | | | |
| 723 | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data appear Lognormal at 5% Significance Level | | | |
| 724 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 725 | | | | | | | | | | | | |
| 726 | **Lognormal Statistics** | | | | | | | | | | | |
| 727 | | | | | Minimum of Logged Data | 8.216 | | | Mean of logged Data | 8.567 | | |
| 728 | | | | | Maximum of Logged Data | 9.06 | | | SD of logged Data | 0.254 | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 729 | | | | | | | | | | | | |
| 730 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 731 | | | | | 95% H-UCL | 6123 | | | 90% Chebyshev (MVUE) UCL | 6458 | | |
| 732 | | | | | 95% Chebyshev (MVUE) UCL | 6929 | | | 97.5% Chebyshev (MVUE) UCL | 7584 | | |
| 733 | | | | | 99% Chebyshev (MVUE) UCL | 8870 | | | | | | |
| 734 | | | | | | | | | | | | |
| 735 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 736 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 737 | | | | | | | | | | | | |
| 738 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 739 | | | | | 95% CLT UCL | 6018 | | | 95% Jackknife UCL | 6058 | | |
| 740 | | | | | 95% Standard Bootstrap UCL | 6006 | | | 95% Bootstrap-t UCL | 6209 | | |
| 741 | | | | | 95% Hall's Bootstrap UCL | 6095 | | | 95% Percentile Bootstrap UCL | 6016 | | |
| 742 | | | | | 95% BCA Bootstrap UCL | 6047 | | | | | | |
| 743 | | | | | 90% Chebyshev(Mean, Sd) UCL | 6510 | | | 95% Chebyshev(Mean, Sd) UCL | 7003 | | |
| 744 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 7687 | | | 99% Chebyshev(Mean, Sd) UCL | 9031 | | |
| 745 | | | | | | | | | | | | |
| 746 | **Suggested UCL to Use** | | | | | | | | | | | |
| 747 | | | | | 95% Student's-t UCL | 6058 | | | | | | |
| 748 | | | | | | | | | | | | |
| 749 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 750 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 751 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 752 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 753 | | | | | | | | | | | | |
| 754 | | | | | | | | | | | | |
| 755 | **Arsenic** | | | | | | | | | | | |
| 756 | | | | | | | | | | | | |
| 757 | **General Statistics** | | | | | | | | | | | |
| 758 | | | | | Total Number of Observations | 16 | | | Number of Distinct Observations | 13 | | |
| 759 | | | | | | | | | Number of Missing Observations | 0 | | |
| 760 | | | | | Minimum | 1.9 | | | Mean | 3.088 | | |
| 761 | | | | | Maximum | 5.4 | | | Median | 2.8 | | |
| 762 | | | | | SD | 1.109 | | | Std. Error of Mean | 0.277 | | |
| 763 | | | | | Coefficient of Variation | 0.359 | | | Skewness | 0.942 | | |
| 764 | | | | | | | | | | | | |
| 765 | **Normal GOF Test** | | | | | | | | | | | |
| 766 | | | | | Shapiro Wilk Test Statistic | 0.881 | | | **Shapiro Wilk GOF Test** | | | |
| 767 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data Not Normal at 5% Significance Level | | | |
| 768 | | | | | Lilliefors Test Statistic | 0.17 | | | **Lilliefors GOF Test** | | | |
| 769 | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data appear Normal at 5% Significance Level | | | |
| 770 | **Data appear Approximate Normal at 5% Significance Level** | | | | | | | | | | | |
| 771 | | | | | | | | | | | | |
| 772 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 773 | **95% Normal UCL** | | | | | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 774 | | | | | 95% Student's-t UCL | 3.573 | | | 95% Adjusted-CLT UCL (Chen-1995) | 3.613 | | |
| 775 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 3.584 | | |
| 776 | | | | | | | | | | | | |
| 777 | **Gamma GOF Test** | | | | | | | | | | | |
| 778 | | | | | A-D Test Statistic | 0.516 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 779 | | | | | 5% A-D Critical Value | 0.739 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 780 | | | | | K-S Test Statistic | 0.154 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 781 | | | | 5% K-S Critical Value | | 0.215 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 782 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 783 | | | | | | | | | | | | |
| 784 | **Gamma Statistics** | | | | | | | | | | | |
| 785 | | | | k hat (MLE) | | 9.209 | k star (bias corrected MLE) | | | | | 7.524 |
| 786 | | | | Theta hat (MLE) | | 0.335 | Theta star (bias corrected MLE) | | | | | 0.41 |
| 787 | | | | nu hat (MLE) | | 294.7 | nu star (bias corrected) | | | | | 240.8 |
| 788 | | | | MLE Mean (bias corrected) | | 3.088 | MLE Sd (bias corrected) | | | | | 1.126 |
| 789 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 205.8 |
| 790 | | | | Adjusted Level of Significance | | 0.0335 | Adjusted Chi Square Value | | | | | 202.2 |
| 791 | | | | | | | | | | | | |
| 792 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 793 | | | 95% Approximate Gamma UCL (use when n>=50)) | | | 3.611 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 3.677 |
| 794 | | | | | | | | | | | | |
| 795 | **Lognormal GOF Test** | | | | | | | | | | | |
| 796 | | | | Shapiro Wilk Test Statistic | | 0.928 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 797 | | | | 5% Shapiro Wilk Critical Value | | 0.887 | Data appear Lognormal at 5% Significance Level | | | | | |
| 798 | | | | Lilliefors Test Statistic | | 0.136 | **Lilliefors Lognormal GOF Test** | | | | | |
| 799 | | | | 5% Lilliefors Critical Value | | 0.213 | Data appear Lognormal at 5% Significance Level | | | | | |
| 800 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 801 | | | | | | | | | | | | |
| 802 | **Lognormal Statistics** | | | | | | | | | | | |
| 803 | | | | Minimum of Logged Data | | 0.642 | Mean of logged Data | | | | | 1.072 |
| 804 | | | | Maximum of Logged Data | | 1.686 | SD of logged Data | | | | | 0.337 |
| 805 | | | | | | | | | | | | |
| 806 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 807 | | | | 95% H-UCL | | 3.647 | 90% Chebyshev (MVUE) UCL | | | | | 3.869 |
| 808 | | | | 95% Chebyshev (MVUE) UCL | | 4.227 | 97.5% Chebyshev (MVUE) UCL | | | | | 4.723 |
| 809 | | | | 99% Chebyshev (MVUE) UCL | | 5.697 | | | | | | |
| 810 | | | | | | | | | | | | |
| 811 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 812 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 813 | | | | | | | | | | | | |
| 814 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 815 | | | | 95% CLT UCL | | 3.543 | 95% Jackknife UCL | | | | | 3.573 |
| 816 | | | | 95% Standard Bootstrap UCL | | 3.523 | 95% Bootstrap-t UCL | | | | | 3.709 |
| 817 | | | | 95% Hall's Bootstrap UCL | | 3.568 | 95% Percentile Bootstrap UCL | | | | | 3.531 |
| 818 | | | | 95% BCA Bootstrap UCL | | 3.625 | | | | | | |
| 819 | | | | 90% Chebyshev(Mean, Sd) UCL | | 3.919 | 95% Chebyshev(Mean, Sd) UCL | | | | | 4.296 |
| 820 | | | | 97.5% Chebyshev(Mean, Sd) UCL | | 4.818 | 99% Chebyshev(Mean, Sd) UCL | | | | | 5.845 |
| 821 | | | | | | | | | | | | |
| 822 | **Suggested UCL to Use** | | | | | | | | | | | |
| 823 | | | | 95% Student's-t UCL | | 3.573 | | | | | | |
| 824 | | | | | | | | | | | | |
| 825 | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | | | | | |
| 826 | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | | | | | |
| 827 | | | | | | | | | | | | |
| 828 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 829 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 830 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 831 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 832 | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 833 | | | | | | | | | | | | |
| 834 | **Chromium VI** | | | | | | | | | | | |
| 835 | | | | | | | | | | | | |
| 836 | **General Statistics** | | | | | | | | | | | |
| 837 | | | | | Total Number of Observations | 16 | | | Number of Distinct Observations | 14 | | |
| 838 | | | | | | | | | Number of Missing Observations | 0 | | |
| 839 | | | | | Minimum | 4.5 | | | Mean | 7.247 | | |
| 840 | | | | | Maximum | 12 | | | Median | 7.275 | | |
| 841 | | | | | SD | 2.314 | | | Std. Error of Mean | 0.578 | | |
| 842 | | | | | Coefficient of Variation | 0.319 | | | Skewness | 0.544 | | |
| 843 | | | | | | | | | | | | |
| 844 | **Normal GOF Test** | | | | | | | | | | | |
| 845 | | | | | Shapiro Wilk Test Statistic | 0.918 | | | **Shapiro Wilk GOF Test** | | | |
| 846 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data appear Normal at 5% Significance Level | | | |
| 847 | | | | | Lilliefors Test Statistic | 0.172 | | | **Lilliefors GOF Test** | | | |
| 848 | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data appear Normal at 5% Significance Level | | | |
| 849 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 850 | | | | | | | | | | | | |
| 851 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 852 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 853 | | | | | 95% Student's-t UCL | 8.261 | | | 95% Adjusted-CLT UCL (Chen-1995) | 8.282 | | |
| 854 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 8.274 | | |
| 855 | | | | | | | | | | | | |
| 856 | **Gamma GOF Test** | | | | | | | | | | | |
| 857 | | | | | A-D Test Statistic | 0.478 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 858 | | | | | 5% A-D Critical Value | 0.739 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 859 | | | | | K-S Test Statistic | 0.164 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | | |
| 860 | | | | | 5% K-S Critical Value | 0.215 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 861 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 862 | | | | | | | | | | | | |
| 863 | **Gamma Statistics** | | | | | | | | | | | |
| 864 | | | | | k hat (MLE) | 10.81 | | | k star (bias corrected MLE) | 8.821 | | |
| 865 | | | | | Theta hat (MLE) | 0.671 | | | Theta star (bias corrected MLE) | 0.822 | | |
| 866 | | | | | nu hat (MLE) | 345.8 | | | nu star (bias corrected) | 282.3 | | |
| 867 | | | | | MLE Mean (bias corrected) | 7.247 | | | MLE Sd (bias corrected) | 2.44 | | |
| 868 | | | | | | | | | Approximate Chi Square Value (0.05) | 244.4 | | |
| 869 | | | | | Adjusted Level of Significance | 0.0335 | | | Adjusted Chi Square Value | 240.3 | | |
| 870 | | | | | | | | | | | | |
| 871 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 872 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 8.371 | | | 95% Adjusted Gamma UCL (use when n<50) | 8.511 | | |
| 873 | | | | | | | | | | | | |
| 874 | **Lognormal GOF Test** | | | | | | | | | | | |
| 875 | | | | | Shapiro Wilk Test Statistic | 0.93 | | | **Shapiro Wilk Lognormal GOF Test** | | | |
| 876 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data appear Lognormal at 5% Significance Level | | | |
| 877 | | | | | Lilliefors Test Statistic | 0.149 | | | **Lilliefors Lognormal GOF Test** | | | |
| 878 | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data appear Lognormal at 5% Significance Level | | | |
| 879 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 880 | | | | | | | | | | | | |
| 881 | **Lognormal Statistics** | | | | | | | | | | | |
| 882 | | | | | Minimum of Logged Data | 1.504 | | | Mean of logged Data | 1.934 | | |
| 883 | | | | | Maximum of Logged Data | 2.485 | | | SD of logged Data | 0.316 | | |
| 884 | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 885 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 886 | | | | | 95% H-UCL | 8.474 | | | 90% Chebyshev (MVUE) UCL | 8.983 | | |
| 887 | | | | | 95% Chebyshev (MVUE) UCL | 9.771 | | | 97.5% Chebyshev (MVUE) UCL | 10.86 | | |
| 888 | | | | | 99% Chebyshev (MVUE) UCL | 13.01 | | | | | | |
| 889 | | | | | | | | | | | | |
| 890 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 891 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 892 | | | | | | | | | | | | |
| 893 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 894 | | | | | 95% CLT UCL | 8.198 | | | 95% Jackknife UCL | 8.261 | | |
| 895 | | | | | 95% Standard Bootstrap UCL | 8.152 | | | 95% Bootstrap-t UCL | 8.319 | | |
| 896 | | | | | 95% Hall's Bootstrap UCL | 8.288 | | | 95% Percentile Bootstrap UCL | 8.216 | | |
| 897 | | | | | 95% BCA Bootstrap UCL | 8.266 | | | | | | |
| 898 | | | | | 90% Chebyshev(Mean, Sd) UCL | 8.982 | | | 95% Chebyshev(Mean, Sd) UCL | 9.768 | | |
| 899 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 10.86 | | | 99% Chebyshev(Mean, Sd) UCL | 13 | | |
| 900 | | | | | | | | | | | | |
| 901 | **Suggested UCL to Use** | | | | | | | | | | | |
| 902 | | | | | 95% Student's-t UCL | 8.261 | | | | | | |
| 903 | | | | | | | | | | | | |
| 904 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 905 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 906 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 907 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 908 | | | | | | | | | | | | |
| 909 | | | | | | | | | | | | |
| 910 | **Cobalt** | | | | | | | | | | | |
| 911 | | | | | | | | | | | | |
| 912 | **General Statistics** | | | | | | | | | | | |
| 913 | | | | | Total Number of Observations | 16 | | | Number of Distinct Observations | 13 | | |
| 914 | | | | | | | | | Number of Missing Observations | 0 | | |
| 915 | | | | | Minimum | 2.5 | | | Mean | 3.872 | | |
| 916 | | | | | Maximum | 6 | | | Median | 3.3 | | |
| 917 | | | | | SD | 1.209 | | | Std. Error of Mean | 0.302 | | |
| 918 | | | | | Coefficient of Variation | 0.312 | | | Skewness | 0.684 | | |
| 919 | | | | | | | | | | | | |
| 920 | **Normal GOF Test** | | | | | | | | | | | |
| 921 | | | | | Shapiro Wilk Test Statistic | 0.871 | | | **Shapiro Wilk GOF Test** | | | |
| 922 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data Not Normal at 5% Significance Level | | | |
| 923 | | | | | Lilliefors Test Statistic | 0.244 | | | **Lilliefors GOF Test** | | | |
| 924 | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data Not Normal at 5% Significance Level | | | |
| 925 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 926 | | | | | | | | | | | | |
| 927 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 928 | **95% Normal UCL** | | | | | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 929 | | | | | 95% Student's-t UCL | 4.402 | | | 95% Adjusted-CLT UCL (Chen-1995) | 4.424 | | |
| 930 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 4.41 | | |
| 931 | | | | | | | | | | | | |
| 932 | **Gamma GOF Test** | | | | | | | | | | | |
| 933 | | | | | A-D Test Statistic | 0.728 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 934 | | | | | 5% A-D Critical Value | 0.739 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | |
| 935 | | | | | K-S Test Statistic | 0.231 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | | |
| 936 | | | | | 5% K-S Critical Value | 0.215 | | | Data Not Gamma Distributed at 5% Significance Level | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 937 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 938 | | | | | | | | | | | | |
| 939 | **Gamma Statistics** | | | | | | | | | | | |
| 940 | | | | | | k hat (MLE) | 11.73 | | | k star (bias corrected MLE) | 9.575 | |
| 941 | | | | | | Theta hat (MLE) | 0.33 | | | Theta star (bias corrected MLE) | 0.404 | |
| 942 | | | | | | nu hat (MLE) | 375.5 | | | nu star (bias corrected) | 306.4 | |
| 943 | | | | | | MLE Mean (bias corrected) | 3.872 | | | MLE Sd (bias corrected) | 1.251 | |
| 944 | | | | | | | | | | Approximate Chi Square Value (0.05) | 266.9 | |
| 945 | | | | | | Adjusted Level of Significance | 0.0335 | | | Adjusted Chi Square Value | 262.7 | |
| 946 | | | | | | | | | | | | |
| 947 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 948 | | | | | 95% Approximate Gamma UCL (use when n>=50) | | 4.446 | | | 95% Adjusted Gamma UCL (use when n<50) | 4.517 | |
| 949 | | | | | | | | | | | | |
| 950 | **Lognormal GOF Test** | | | | | | | | | | | |
| 951 | | | | | | Shapiro Wilk Test Statistic | 0.902 | | | **Shapiro Wilk Lognormal GOF Test** | | |
| 952 | | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | Data appear Lognormal at 5% Significance Level | | |
| 953 | | | | | | Lilliefors Test Statistic | 0.214 | | | **Lilliefors Lognormal GOF Test** | | |
| 954 | | | | | | 5% Lilliefors Critical Value | 0.213 | | | Data Not Lognormal at 5% Significance Level | | |
| 955 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 956 | | | | | | | | | | | | |
| 957 | **Lognormal Statistics** | | | | | | | | | | | |
| 958 | | | | | | Minimum of Logged Data | 0.916 | | | Mean of logged Data | 1.311 | |
| 959 | | | | | | Maximum of Logged Data | 1.792 | | | SD of logged Data | 0.299 | |
| 960 | | | | | | | | | | | | |
| 961 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 962 | | | | | | 95% H-UCL | 4.481 | | | 90% Chebyshev (MVUE) UCL | 4.746 | |
| 963 | | | | | | 95% Chebyshev (MVUE) UCL | 5.144 | | | 97.5% Chebyshev (MVUE) UCL | 5.696 | |
| 964 | | | | | | 99% Chebyshev (MVUE) UCL | 6.781 | | | | | |
| 965 | | | | | | | | | | | | |
| 966 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 967 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 968 | | | | | | | | | | | | |
| 969 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 970 | | | | | | 95% CLT UCL | 4.369 | | | 95% Jackknife UCL | 4.402 | |
| 971 | | | | | | 95% Standard Bootstrap UCL | 4.359 | | | 95% Bootstrap-t UCL | 4.496 | |
| 972 | | | | | | 95% Hall's Bootstrap UCL | 4.361 | | | 95% Percentile Bootstrap UCL | 4.344 | |
| 973 | | | | | | 95% BCA Bootstrap UCL | 4.409 | | | | | |
| 974 | | | | | | 90% Chebyshev(Mean, Sd) UCL | 4.779 | | | 95% Chebyshev(Mean, Sd) UCL | 5.189 | |
| 975 | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 5.759 | | | 99% Chebyshev(Mean, Sd) UCL | 6.879 | |
| 976 | | | | | | | | | | | | |
| 977 | **Suggested UCL to Use** | | | | | | | | | | | |
| 978 | | | | | | 95% Adjusted Gamma UCL | 4.517 | | | | | |
| 979 | | | | | | | | | | | | |
| 980 | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | | | | | |
| 981 | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | | | | | |
| 982 | | | | | | | | | | | | |
| 983 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 984 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 985 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 986 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 987 | | | | | | | | | | | | |
| 988 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 989 | **Iron** | | | | | | | | | | | |
| 990 | | | | | | | | | | | | |
| 991 | **General Statistics** | | | | | | | | | | | |
| 992 | | | | | Total Number of Observations | 16 | | | Number of Distinct Observations | 12 | | |
| 993 | | | | | | | | | Number of Missing Observations | 0 | | |
| 994 | | | | | Minimum | 7900 | | | Mean | 11275 | | |
| 995 | | | | | Maximum | 17000 | | | Median | 10000 | | |
| 996 | | | | | SD | 3090 | | | Std. Error of Mean | 772.6 | | |
| 997 | | | | | Coefficient of Variation | 0.274 | | | Skewness | 0.562 | | |
| 998 | | | | | | | | | | | | |
| 999 | **Normal GOF Test** | | | | | | | | | | | |
| 1000 | | | | | Shapiro Wilk Test Statistic | 0.861 | **Shapiro Wilk GOF Test** | | | | | |
| 1001 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Data Not Normal at 5% Significance Level | | | | | |
| 1002 | | | | | Lilliefors Test Statistic | 0.223 | **Lilliefors GOF Test** | | | | | |
| 1003 | | | | | 5% Lilliefors Critical Value | 0.213 | Data Not Normal at 5% Significance Level | | | | | |
| 1004 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1005 | | | | | | | | | | | | |
| 1006 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1007 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 1008 | | | | | 95% Student's-t UCL | 12629 | | | 95% Adjusted-CLT UCL (Chen-1995) | 12662 | | |
| 1009 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 12647 | | |
| 1010 | | | | | | | | | | | | |
| 1011 | **Gamma GOF Test** | | | | | | | | | | | |
| 1012 | | | | | A-D Test Statistic | 0.923 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1013 | | | | | 5% A-D Critical Value | 0.738 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1014 | | | | | K-S Test Statistic | 0.206 | **Kolmogorov-Smirnov Gamma GOF Test** | | | | | |
| 1015 | | | | | 5% K-S Critical Value | 0.215 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1016 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1017 | | | | | | | | | | | | |
| 1018 | **Gamma Statistics** | | | | | | | | | | | |
| 1019 | | | | | k hat (MLE) | 14.94 | | | k star (bias corrected MLE) | 12.18 | | |
| 1020 | | | | | Theta hat (MLE) | 754.9 | | | Theta star (bias corrected MLE) | 925.9 | | |
| 1021 | | | | | nu hat (MLE) | 478 | | | nu star (bias corrected) | 389.7 | | |
| 1022 | | | | | MLE Mean (bias corrected) | 11275 | | | MLE Sd (bias corrected) | 3231 | | |
| 1023 | | | | | | | | | Approximate Chi Square Value (0.05) | 344.9 | | |
| 1024 | | | | | Adjusted Level of Significance | 0.0335 | | | Adjusted Chi Square Value | 340.1 | | |
| 1025 | | | | | | | | | | | | |
| 1026 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1027 | | | | | 95% Approximate Gamma UCL (use when n>=50) | 12738 | | | 95% Adjusted Gamma UCL (use when n<50) | 12917 | | |
| 1028 | | | | | | | | | | | | |
| 1029 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1030 | | | | | Shapiro Wilk Test Statistic | 0.877 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1031 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1032 | | | | | Lilliefors Test Statistic | 0.19 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1033 | | | | | 5% Lilliefors Critical Value | 0.213 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1034 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1035 | | | | | | | | | | | | |
| 1036 | **Lognormal Statistics** | | | | | | | | | | | |
| 1037 | | | | | Minimum of Logged Data | 8.975 | | | Mean of logged Data | 9.296 | | |
| 1038 | | | | | Maximum of Logged Data | 9.741 | | | SD of logged Data | 0.266 | | |
| 1039 | | | | | | | | | | | | |
| 1040 | **Assuming Lognormal Distribution** | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1041 | | | | | 95% H-UCL | 12817 | | | | 90% Chebyshev (MVUE) UCL | | 13535 |
| 1042 | | | | | 95% Chebyshev (MVUE) UCL | 14562 | | | | 97.5% Chebyshev (MVUE) UCL | | 15988 |
| 1043 | | | | | 99% Chebyshev (MVUE) UCL | 18790 | | | | | | |
| 1044 | | | | | | | | | | | | |
| 1045 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 1046 | | | | | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | |
| 1047 | | | | | | | | | | | | |
| 1048 | | | | | **Nonparametric Distribution Free UCLs** | | | | | | | |
| 1049 | | | | | 95% CLT UCL | 12546 | | | | 95% Jackknife UCL | | 12629 |
| 1050 | | | | | 95% Standard Bootstrap UCL | 12495 | | | | 95% Bootstrap-t UCL | | 12824 |
| 1051 | | | | | 95% Hall's Bootstrap UCL | 12521 | | | | 95% Percentile Bootstrap UCL | | 12513 |
| 1052 | | | | | 95% BCA Bootstrap UCL | 12606 | | | | | | |
| 1053 | | | | | 90% Chebyshev(Mean, Sd) UCL | 13593 | | | | 95% Chebyshev(Mean, Sd) UCL | | 14643 |
| 1054 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 16100 | | | | 99% Chebyshev(Mean, Sd) UCL | | 18962 |
| 1055 | | | | | | | | | | | | |
| 1056 | | | | | **Suggested UCL to Use** | | | | | | | |
| 1057 | | | | | 95% Adjusted Gamma UCL | 12917 | | | | | | |
| 1058 | | | | | | | | | | | | |
| 1059 | | | | | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | |
| 1060 | | | | | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | |
| 1061 | | | | | | | | | | | | |
| 1062 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 1063 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 1064 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 1065 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 1066 | | | | | | | | | | | | |
| 1067 | | | | | | | | | | | | |
| 1068 | **Manganese** | | | | | | | | | | | |
| 1069 | | | | | | | | | | | | |
| 1070 | | | | | **General Statistics** | | | | | | | |
| 1071 | | | | | Total Number of Observations | 16 | | | | Number of Distinct Observations | | 12 |
| 1072 | | | | | | | | | | Number of Missing Observations | | 0 |
| 1073 | | | | | Minimum | 240 | | | | Mean | | 359.1 |
| 1074 | | | | | Maximum | 880 | | | | Median | | 300 |
| 1075 | | | | | SD | 168.4 | | | | Std. Error of Mean | | 42.11 |
| 1076 | | | | | Coefficient of Variation | 0.469 | | | | Skewness | | 2.379 |
| 1077 | | | | | | | | | | | | |
| 1078 | | | | | **Normal GOF Test** | | | | | | | |
| 1079 | | | | | Shapiro Wilk Test Statistic | 0.661 | | | | **Shapiro Wilk GOF Test** | | |
| 1080 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | | | | Data Not Normal at 5% Significance Level | | |
| 1081 | | | | | Lilliefors Test Statistic | 0.346 | | | | **Lilliefors GOF Test** | | |
| 1082 | | | | | 5% Lilliefors Critical Value | 0.213 | | | | Data Not Normal at 5% Significance Level | | |
| 1083 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 1084 | | | | | | | | | | | | |
| 1085 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 1086 | | | | | **95% Normal UCL** | | | | | **95% UCLs (Adjusted for Skewness)** | | |
| 1087 | | | | | 95% Student's-t UCL | 432.9 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 455.1 |
| 1088 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 437.1 |
| 1089 | | | | | | | | | | | | |
| 1090 | | | | | **Gamma GOF Test** | | | | | | | |
| 1091 | | | | | A-D Test Statistic | 1.734 | | | | **Anderson-Darling Gamma GOF Test** | | |
| 1092 | | | | | 5% A-D Critical Value | 0.74 | | | | Data Not Gamma Distributed at 5% Significance Level | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1093 | | | | | K-S Test Statistic | 0.305 | **Kolmogorov-Smirnov Gamma GOF Test** | | | | | |
| 1094 | | | | | 5% K-S Critical Value | 0.216 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 1095 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1096 | | | | | | | | | | | | |
| 1097 | **Gamma Statistics** | | | | | | | | | | | |
| 1098 | | | | | k hat (MLE) | 7.172 | k star (bias corrected MLE) | | | | | 5.869 |
| 1099 | | | | | Theta hat (MLE) | 50.06 | Theta star (bias corrected MLE) | | | | | 61.18 |
| 1100 | | | | | nu hat (MLE) | 229.5 | nu star (bias corrected) | | | | | 187.8 |
| 1101 | | | | | MLE Mean (bias corrected) | 359.1 | MLE Sd (bias corrected) | | | | | 148.2 |
| 1102 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 157.1 |
| 1103 | | | | | Adjusted Level of Significance | 0.0335 | Adjusted Chi Square Value | | | | | 153.9 |
| 1104 | | | | | | | | | | | | |
| 1105 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1106 | | | | 95% Approximate Gamma UCL (use when n>=50)) | | 429.2 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 438.1 |
| 1107 | | | | | | | | | | | | |
| 1108 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1109 | | | | | Shapiro Wilk Test Statistic | 0.776 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1110 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1111 | | | | | Lilliefors Test Statistic | 0.277 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1112 | | | | | 5% Lilliefors Critical Value | 0.213 | Data Not Lognormal at 5% Significance Level | | | | | |
| 1113 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1114 | | | | | | | | | | | | |
| 1115 | **Lognormal Statistics** | | | | | | | | | | | |
| 1116 | | | | | Minimum of Logged Data | 5.481 | Mean of logged Data | | | | | 5.812 |
| 1117 | | | | | Maximum of Logged Data | 6.78 | SD of logged Data | | | | | 0.357 |
| 1118 | | | | | | | | | | | | |
| 1119 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1120 | | | | | 95% H-UCL | 425.2 | 90% Chebyshev (MVUE) UCL | | | | | 451.5 |
| 1121 | | | | | 95% Chebyshev (MVUE) UCL | 495.2 | 97.5% Chebyshev (MVUE) UCL | | | | | 556 |
| 1122 | | | | | 99% Chebyshev (MVUE) UCL | 675.3 | | | | | | |
| 1123 | | | | | | | | | | | | |
| 1124 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1125 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 1126 | | | | | | | | | | | | |
| 1127 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1128 | | | | | 95% CLT UCL | 428.3 | 95% Jackknife UCL | | | | | 432.9 |
| 1129 | | | | | 95% Standard Bootstrap UCL | 425.1 | 95% Bootstrap-t UCL | | | | | 501.3 |
| 1130 | | | | | 95% Hall's Bootstrap UCL | 457.8 | 95% Percentile Bootstrap UCL | | | | | 430.6 |
| 1131 | | | | | 95% BCA Bootstrap UCL | 456.9 | | | | | | |
| 1132 | | | | | 90% Chebyshev(Mean, Sd) UCL | 485.4 | 95% Chebyshev(Mean, Sd) UCL | | | | | 542.6 |
| 1133 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 622 | 99% Chebyshev(Mean, Sd) UCL | | | | | 778.1 |
| 1134 | | | | | | | | | | | | |
| 1135 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1136 | | | | | 95% Student's-t UCL | 432.9 | or 95% Modified-t UCL | | | | | 437.1 |
| 1137 | | | | | | | | | | | | |
| 1138 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1139 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1140 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1141 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1142 | | | | | | | | | | | | |
| 1143 | | | | | | | | | | | | |
| 1144 | **Vanadium** | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1145 | | | | | | | | | | | | |
| 1146 | **General Statistics** | | | | | | | | | | | |
| 1147 | | | | | Total Number of Observations | 16 | | | | Number of Distinct Observations | 14 | |
| 1148 | | | | | | | | | | Number of Missing Observations | 0 | |
| 1149 | | | | | Minimum | 6.9 | | | | Mean | 10.39 | |
| 1150 | | | | | Maximum | 15 | | | | Median | 10.15 | |
| 1151 | | | | | SD | 2.814 | | | | Std. Error of Mean | 0.703 | |
| 1152 | | | | | Coefficient of Variation | 0.271 | | | | Skewness | 0.229 | |
| 1153 | | | | | | | | | | | | |
| 1154 | **Normal GOF Test** | | | | | | | | | | | |
| 1155 | | | | | Shapiro Wilk Test Statistic | 0.911 | **Shapiro Wilk GOF Test** | | | | | |
| 1156 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Data appear Normal at 5% Significance Level | | | | | |
| 1157 | | | | | Lilliefors Test Statistic | 0.152 | **Lilliefors GOF Test** | | | | | |
| 1158 | | | | | 5% Lilliefors Critical Value | 0.213 | Data appear Normal at 5% Significance Level | | | | | |
| 1159 | **Data appear Normal at 5% Significance Level** | | | | | | | | | | | |
| 1160 | | | | | | | | | | | | |
| 1161 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1162 | | | | | **95% Normal UCL** | | | | | **95% UCLs (Adjusted for Skewness)** | | |
| 1163 | | | | | 95% Student's-t UCL | 11.62 | | | | 95% Adjusted-CLT UCL (Chen-1995) | 11.59 | |
| 1164 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 11.63 | |
| 1165 | | | | | | | | | | | | |
| 1166 | **Gamma GOF Test** | | | | | | | | | | | |
| 1167 | | | | | A-D Test Statistic | 0.529 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 1168 | | | | | 5% A-D Critical Value | 0.738 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1169 | | | | | K-S Test Statistic | 0.163 | **Kolmogorov-Smirnov Gamma GOF Test** | | | | | |
| 1170 | | | | | 5% K-S Critical Value | 0.215 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 1171 | **Detected data appear Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1172 | | | | | | | | | | | | |
| 1173 | **Gamma Statistics** | | | | | | | | | | | |
| 1174 | | | | | k hat (MLE) | 14.45 | | | | k star (bias corrected MLE) | 11.79 | |
| 1175 | | | | | Theta hat (MLE) | 0.719 | | | | Theta star (bias corrected MLE) | 0.881 | |
| 1176 | | | | | nu hat (MLE) | 462.5 | | | | nu star (bias corrected) | 377.1 | |
| 1177 | | | | | MLE Mean (bias corrected) | 10.39 | | | | MLE Sd (bias corrected) | 3.026 | |
| 1178 | | | | | | | | | | Approximate Chi Square Value (0.05) | 333.1 | |
| 1179 | | | | | Adjusted Level of Significance | 0.0335 | | | | Adjusted Chi Square Value | 328.4 | |
| 1180 | | | | | | | | | | | | |
| 1181 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1182 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 11.76 | | | | 95% Adjusted Gamma UCL (use when n<50) | 11.93 | |
| 1183 | | | | | | | | | | | | |
| 1184 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1185 | | | | | Shapiro Wilk Test Statistic | 0.912 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1186 | | | | | 5% Shapiro Wilk Critical Value | 0.887 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1187 | | | | | Lilliefors Test Statistic | 0.156 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1188 | | | | | 5% Lilliefors Critical Value | 0.213 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1189 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1190 | | | | | | | | | | | | |
| 1191 | **Lognormal Statistics** | | | | | | | | | | | |
| 1192 | | | | | Minimum of Logged Data | 1.932 | | | | Mean of logged Data | 2.306 | |
| 1193 | | | | | Maximum of Logged Data | 2.708 | | | | SD of logged Data | 0.274 | |
| 1194 | | | | | | | | | | | | |
| 1195 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1196 | | | | | 95% H-UCL | 11.88 | | | | 90% Chebyshev (MVUE) UCL | 12.55 | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1197 | | | | 95% Chebyshev (MVUE) UCL | | 13.53 | | | | 97.5% Chebyshev (MVUE) UCL | | 14.89 |
| 1198 | | | | 99% Chebyshev (MVUE) UCL | | 17.56 | | | | | | |
| 1199 | | | | | | | | | | | | |
| 1200 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1201 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1202 | | | | | | | | | | | | |
| 1203 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1204 | | | | 95% CLT UCL | | 11.54 | | | | 95% Jackknife UCL | | 11.62 |
| 1205 | | | | 95% Standard Bootstrap UCL | | 11.51 | | | | 95% Bootstrap-t UCL | | 11.69 |
| 1206 | | | | 95% Hall's Bootstrap UCL | | 11.52 | | | | 95% Percentile Bootstrap UCL | | 11.49 |
| 1207 | | | | 95% BCA Bootstrap UCL | | 11.55 | | | | | | |
| 1208 | | | | 90% Chebyshev(Mean, Sd) UCL | | 12.5 | | | | 95% Chebyshev(Mean, Sd) UCL | | 13.45 |
| 1209 | | | | 97.5% Chebyshev(Mean, Sd) UCL | | 14.78 | | | | 99% Chebyshev(Mean, Sd) UCL | | 17.39 |
| 1210 | | | | | | | | | | | | |
| 1211 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1212 | | | | 95% Student's-t UCL | | 11.62 | | | | | | |
| 1213 | | | | | | | | | | | | |
| 1214 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1215 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1216 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1217 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1218 | | | | | | | | | | | | |

# Resident - Scenario 2 and Construction Worker (soil from 0 ft bgs to water table)

## UCL Statistics for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.12/20/2018 4:52:21 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**Benzo[a]anthracene**

### General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 40 | Number of Distinct Observations | 31 |
| Number of Detects | 24 | Number of Non-Detects | 16 |
| Number of Distinct Detects | 24 | Number of Distinct Non-Detects | 7 |
| Minimum Detect | 0.0012 | Minimum Non-Detect | 0.0024 |
| Maximum Detect | 19 | Maximum Non-Detect | 0.0041 |
| Variance Detects | 14.88 | Percent Non-Detects | 40% |
| Mean Detects | 0.93 | SD Detects | 3.857 |
| Median Detects | 0.0695 | CV Detects | 4.146 |
| Skewness Detects | 4.864 | Kurtosis Detects | 23.75 |
| Mean of Logged Detects | -2.71 | SD of Logged Detects | 1.978 |

### Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.247 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.916 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.461 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.177 | 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

| | | | |
|---|---|---|---|
| KM Mean | 0.559 | KM Standard Error of Mean | 0.478 |
| KM SD | 2.96 | 95% KM (BCA) UCL | 1.56 |
| 95% KM (t) UCL | 1.364 | 95% KM (Percentile Bootstrap) UCL | 1.49 |
| 95% KM (z) UCL | 1.345 | 95% KM Bootstrap t UCL | 17.79 |
| 90% KM Chebyshev UCL | 1.993 | 95% KM Chebyshev UCL | 2.643 |
| 97.5% KM Chebyshev UCL | 3.545 | 99% KM Chebyshev UCL | 5.316 |

### Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 3.489 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.867 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.344 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.195 | 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) | 0.266 | k star (bias corrected MLE) | 0.261 |
| Theta hat (MLE) | 3.491 | Theta star (bias corrected MLE) | 3.565 |
| nu hat (MLE) | 12.79 | nu star (bias corrected) | 12.53 |
| Mean (detects) | 0.93 | | |

### Gamma ROS Statistics using Imputed Non-Detects

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 54 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 55 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 56 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 57 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 58 | | | | | Minimum | 0.0012 | | | | Mean | 0.562 | |
| 59 | | | | | Maximum | 19 | | | | Median | 0.0105 | |
| 60 | | | | | SD | 2.997 | | | | CV | 5.331 | |
| 61 | | | | | k hat (MLE) | 0.246 | | | | k star (bias corrected MLE) | 0.244 | |
| 62 | | | | | Theta hat (MLE) | 2.284 | | | | Theta star (bias corrected MLE) | 2.301 | |
| 63 | | | | | nu hat (MLE) | 19.7 | | | | nu star (bias corrected) | 19.55 | |
| 64 | | | | | Adjusted Level of Significance (β) | 0.044 | | | | | | |
| 65 | | | | | Approximate Chi Square Value (19.55, α) | 10.52 | | | | Adjusted Chi Square Value (19.55, β) | 10.27 | |
| 66 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.045 | | | | 95% Gamma Adjusted UCL (use when n<50) | 1.07 | |
| 67 | | | | | | | | | | | | |
| 68 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 69 | | | | | Mean (KM) | 0.559 | | | | SD (KM) | 2.96 | |
| 70 | | | | | Variance (KM) | 8.763 | | | | SE of Mean (KM) | 0.478 | |
| 71 | | | | | k hat (KM) | 0.0356 | | | | k star (KM) | 0.0496 | |
| 72 | | | | | nu hat (KM) | 2.85 | | | | nu star (KM) | 3.97 | |
| 73 | | | | | theta hat (KM) | 15.68 | | | | theta star (KM) | 11.26 | |
| 74 | | | | | 80% gamma percentile (KM) | 0.0738 | | | | 90% gamma percentile (KM) | 0.844 | |
| 75 | | | | | 95% gamma percentile (KM) | 2.964 | | | | 99% gamma percentile (KM) | 12.19 | |
| 76 | | | | | | | | | | | | |
| 77 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 78 | | | | | Approximate Chi Square Value (3.97, α) | 0.71 | | | | Adjusted Chi Square Value (3.97, β) | 0.662 | |
| 79 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 3.125 | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 3.35 | |
| 80 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 81 | | | | | | | | | | | | |
| 82 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 83 | | | | | Shapiro Wilk Test Statistic | 0.935 | | | | **Shapiro Wilk GOF Test** | | |
| 84 | | | | | 5% Shapiro Wilk Critical Value | 0.916 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 85 | | | | | Lilliefors Test Statistic | 0.163 | | | | **Lilliefors GOF Test** | | |
| 86 | | | | | 5% Lilliefors Critical Value | 0.177 | | | | Detected Data appear Lognormal at 5% Significance Level | | |
| 87 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 88 | | | | | | | | | | | | |
| 89 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 90 | | | | | Mean in Original Scale | 0.559 | | | | Mean in Log Scale | -4.398 | |
| 91 | | | | | SD in Original Scale | 2.998 | | | | SD in Log Scale | 2.65 | |
| 92 | | | | | 95% t UCL (assumes normality of ROS data) | 1.357 | | | | 95% Percentile Bootstrap UCL | 1.501 | |
| 93 | | | | | 95% BCA Bootstrap UCL | 2.033 | | | | 95% Bootstrap t UCL | 17.97 | |
| 94 | | | | | 95% H-UCL (Log ROS) | 3.119 | | | | | | |
| 95 | | | | | | | | | | | | |
| 96 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 97 | | | | | KM Mean (logged) | -4.315 | | | | KM Geo Mean | 0.0134 | |
| 98 | | | | | KM SD (logged) | 2.473 | | | | 95% Critical H Value (KM-Log) | 4.497 | |
| 99 | | | | | KM Standard Error of Mean (logged) | 0.399 | | | | 95% H-UCL (KM -Log) | 1.688 | |
| 100 | | | | | KM SD (logged) | 2.473 | | | | 95% Critical H Value (KM-Log) | 4.497 | |
| 101 | | | | | KM Standard Error of Mean (logged) | 0.399 | | | | | | |
| 102 | | | | | | | | | | | | |
| 103 | **DL/2 Statistics** | | | | | | | | | | | |
| 104 | **DL/2 Normal** | | | | | | | | | **DL/2 Log-Transformed** | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | | | | Mean in Original Scale | 0.559 | | | | | Mean in Log Scale | -4.262 | |
| 106 | | | | SD in Original Scale | 2.998 | | | | | SD in Log Scale | 2.453 | |
| 107 | | | | 95% t UCL (Assumes normality) | 1.357 | | | | | 95% H-Stat UCL | 1.653 | |
| 108 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 109 | | | | | | | | | | | | |
| 110 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 111 | **Detected Data appear Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 112 | | | | | | | | | | | | |
| 113 | **Suggested UCL to Use** | | | | | | | | | | | |
| 114 | | | | 95% KM (Chebyshev) UCL | 2.643 | | | | | | | |
| 115 | | | | | | | | | | | | |
| 116 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 117 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 118 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 119 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 120 | | | | | | | | | | | | |
| 121 | **Benzo[a]pyrene** | | | | | | | | | | | |
| 122 | | | | | | | | | | | | |
| 123 | **General Statistics** | | | | | | | | | | | |
| 124 | | | | Total Number of Observations | 40 | | | | | Number of Distinct Observations | 31 | |
| 125 | | | | Number of Detects | 27 | | | | | Number of Non-Detects | 13 | |
| 126 | | | | Number of Distinct Detects | 25 | | | | | Number of Distinct Non-Detects | 7 | |
| 127 | | | | Minimum Detect | 8.2000E-4 | | | | | Minimum Non-Detect | 0.0024 | |
| 128 | | | | Maximum Detect | 17 | | | | | Maximum Non-Detect | 0.0041 | |
| 129 | | | | Variance Detects | 10.6 | | | | | Percent Non-Detects | 32.5% | |
| 130 | | | | Mean Detects | 0.736 | | | | | SD Detects | 3.255 | |
| 131 | | | | Median Detects | 0.072 | | | | | CV Detects | 4.422 | |
| 132 | | | | Skewness Detects | 5.171 | | | | | Kurtosis Detects | 26.81 | |
| 133 | | | | Mean of Logged Detects | -3.208 | | | | | SD of Logged Detects | 2.276 | |
| 134 | | | | | | | | | | | | |
| 135 | **Normal GOF Test on Detects Only** | | | | | | | | | | | |
| 136 | | | | Shapiro Wilk Test Statistic | 0.229 | | | | | **Shapiro Wilk GOF Test** | | |
| 137 | | | | 5% Shapiro Wilk Critical Value | 0.923 | | | | | Detected Data Not Normal at 5% Significance Level | | |
| 138 | | | | Lilliefors Test Statistic | 0.465 | | | | | **Lilliefors GOF Test** | | |
| 139 | | | | 5% Lilliefors Critical Value | 0.167 | | | | | Detected Data Not Normal at 5% Significance Level | | |
| 140 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 141 | | | | | | | | | | | | |
| 142 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | | |
| 143 | | | | KM Mean | 0.497 | | | | | KM Standard Error of Mean | 0.427 | |
| 144 | | | | KM SD | 2.647 | | | | | 95% KM (BCA) UCL | 1.355 | |
| 145 | | | | 95% KM (t) UCL | 1.216 | | | | | 95% KM (Percentile Bootstrap) UCL | 1.328 | |
| 146 | | | | 95% KM (z) UCL | 1.199 | | | | | 95% KM Bootstrap t UCL | 16.07 | |
| 147 | | | | 90% KM Chebyshev UCL | 1.777 | | | | | 95% KM Chebyshev UCL | 2.356 | |
| 148 | | | | 97.5% KM Chebyshev UCL | 3.161 | | | | | 99% KM Chebyshev UCL | 4.741 | |
| 149 | | | | | | | | | | | | |
| 150 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 151 | | | | A-D Test Statistic | 3.217 | | | | | **Anderson-Darling GOF Test** | | |
| 152 | | | | 5% A-D Critical Value | 0.88 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 153 | | | | K-S Test Statistic | 0.313 | | | | | **Kolmogorov-Smirnov GOF** | | |
| 154 | | | | 5% K-S Critical Value | 0.185 | | | | | Detected Data Not Gamma Distributed at 5% Significance Level | | |
| 155 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 156 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 157 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 158 | | | | | k hat (MLE) | 0.246 | | | k star (bias corrected MLE) | | | 0.243 |
| 159 | | | | | Theta hat (MLE) | 2.998 | | | Theta star (bias corrected MLE) | | | 3.03 |
| 160 | | | | | nu hat (MLE) | 13.26 | | | nu star (bias corrected) | | | 13.12 |
| 161 | | | | | Mean (detects) | 0.736 | | | | | | |
| 162 | | | | | | | | | | | | |
| 163 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 164 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 165 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 166 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 167 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 168 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 169 | | | | | Minimum | 8.2000E-4 | | | Mean | | | 0.5 |
| 170 | | | | | Maximum | 17 | | | Median | | | 0.011 |
| 171 | | | | | SD | 2.68 | | | CV | | | 5.359 |
| 172 | | | | | k hat (MLE) | 0.241 | | | k star (bias corrected MLE) | | | 0.239 |
| 173 | | | | | Theta hat (MLE) | 2.078 | | | Theta star (bias corrected MLE) | | | 2.09 |
| 174 | | | | | nu hat (MLE) | 19.26 | | | nu star (bias corrected) | | | 19.15 |
| 175 | | | | | Adjusted Level of Significance (β) | 0.044 | | | | | | |
| 176 | | | | | Approximate Chi Square Value (19.15, α) | 10.22 | | | Adjusted Chi Square Value (19.15, β) | | | 9.978 |
| 177 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.937 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 0.96 |
| 178 | | | | | | | | | | | | |
| 179 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 180 | | | | | Mean (KM) | 0.497 | | | SD (KM) | | | 2.647 |
| 181 | | | | | Variance (KM) | 7.007 | | | SE of Mean (KM) | | | 0.427 |
| 182 | | | | | k hat (KM) | 0.0353 | | | k star (KM) | | | 0.0493 |
| 183 | | | | | nu hat (KM) | 2.823 | | | nu star (KM) | | | 3.944 |
| 184 | | | | | theta hat (KM) | 14.09 | | | theta star (KM) | | | 10.08 |
| 185 | | | | | 80% gamma percentile (KM) | 0.0642 | | | 90% gamma percentile (KM) | | | 0.745 |
| 186 | | | | | 95% gamma percentile (KM) | 2.631 | | | 99% gamma percentile (KM) | | | 10.88 |
| 187 | | | | | | | | | | | | |
| 188 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 189 | | | | | Approximate Chi Square Value (3.94, α) | 0.7 | | | Adjusted Chi Square Value (3.94, β) | | | 0.653 |
| 190 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 2.802 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 3.005 |
| 191 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 192 | | | | | | | | | | | | |
| 193 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 194 | | | | | Shapiro Wilk Test Statistic | 0.936 | | | **Shapiro Wilk GOF Test** | | | |
| 195 | | | | | 5% Shapiro Wilk Critical Value | 0.923 | | | Detected Data appear Lognormal at 5% Significance Level | | | |
| 196 | | | | | Lilliefors Test Statistic | 0.169 | | | **Lilliefors GOF Test** | | | |
| 197 | | | | | 5% Lilliefors Critical Value | 0.167 | | | Detected Data Not Lognormal at 5% Significance Level | | | |
| 198 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 199 | | | | | | | | | | | | |
| 200 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 201 | | | | | Mean in Original Scale | 0.497 | | | Mean in Log Scale | | | -4.345 |
| 202 | | | | | SD in Original Scale | 2.681 | | | SD in Log Scale | | | 2.53 |
| 203 | | | | | 95% t UCL (assumes normality of ROS data) | 1.212 | | | 95% Percentile Bootstrap UCL | | | 1.337 |
| 204 | | | | | 95% BCA Bootstrap UCL | 1.789 | | | 95% Bootstrap t UCL | | | 15.08 |
| 205 | | | | | 95% H-UCL (Log ROS) | 2.044 | | | | | | |
| 206 | | | | | | | | | | | | |
| 207 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 208 | | | | | KM Mean (logged) | -4.402 | | | KM Geo Mean | | | 0.0123 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 209 | | | | KM SD (logged) | 2.52 | | | | 95% Critical H Value (KM-Log) | | | 4.571 |
| 210 | | | | KM Standard Error of Mean (logged) | 0.408 | | | | 95% H-UCL (KM -Log) | | | 1.855 |
| 211 | | | | KM SD (logged) | 2.52 | | | | 95% Critical H Value (KM-Log) | | | 4.571 |
| 212 | | | | KM Standard Error of Mean (logged) | 0.408 | | | | | | | |
| 213 | | | | | | | | | | | | |
| 214 | | | | | DL/2 Statistics | | | | | | | |
| 215 | | | | DL/2 Normal | | | | | DL/2 Log-Transformed | | | |
| 216 | | | | Mean in Original Scale | 0.497 | | | | Mean in Log Scale | | | -4.306 |
| 217 | | | | SD in Original Scale | 2.681 | | | | SD in Log Scale | | | 2.456 |
| 218 | | | | 95% t UCL (Assumes normality) | 1.211 | | | | 95% H-Stat UCL | | | 1.595 |
| 219 | | | | | DL/2 is not a recommended method, provided for comparisons and historical reasons | | | | | | | |
| 220 | | | | | | | | | | | | |
| 221 | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | | |
| 222 | | | | | Detected Data appear Approximate Lognormal Distributed at 5% Significance Level | | | | | | | |
| 223 | | | | | | | | | | | | |
| 224 | | | | | Suggested UCL to Use | | | | | | | |
| 225 | | | | 97.5% KM (Chebyshev) UCL | 3.161 | | | | | | | |
| 226 | | | | | | | | | | | | |
| 227 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 228 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 229 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 230 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |
| 231 | | | | | | | | | | | | |
| 232 | **Benzo[b]fluoranthene** | | | | | | | | | | | |
| 233 | | | | | | | | | | | | |
| 234 | | | | | General Statistics | | | | | | | |
| 235 | | | | Total Number of Observations | 40 | | | | Number of Distinct Observations | | | 30 |
| 236 | | | | Number of Detects | 28 | | | | Number of Non-Detects | | | 12 |
| 237 | | | | Number of Distinct Detects | 25 | | | | Number of Distinct Non-Detects | | | 6 |
| 238 | | | | Minimum Detect | 0.0013 | | | | Minimum Non-Detect | | | 0.0024 |
| 239 | | | | Maximum Detect | 23 | | | | Maximum Non-Detect | | | 0.0029 |
| 240 | | | | Variance Detects | 18.7 | | | | Percent Non-Detects | | | 30% |
| 241 | | | | Mean Detects | 0.972 | | | | SD Detects | | | 4.325 |
| 242 | | | | Median Detects | 0.096 | | | | CV Detects | | | 4.45 |
| 243 | | | | Skewness Detects | 5.262 | | | | Kurtosis Detects | | | 27.78 |
| 244 | | | | Mean of Logged Detects | -2.852 | | | | SD of Logged Detects | | | 2.206 |
| 245 | | | | | | | | | | | | |
| 246 | | | | | Normal GOF Test on Detects Only | | | | | | | |
| 247 | | | | Shapiro Wilk Test Statistic | 0.228 | | | | Shapiro Wilk GOF Test | | | |
| 248 | | | | 5% Shapiro Wilk Critical Value | 0.924 | | | | Detected Data Not Normal at 5% Significance Level | | | |
| 249 | | | | Lilliefors Test Statistic | 0.463 | | | | Lilliefors GOF Test | | | |
| 250 | | | | 5% Lilliefors Critical Value | 0.164 | | | | Detected Data Not Normal at 5% Significance Level | | | |
| 251 | | | | | Detected Data Not Normal at 5% Significance Level | | | | | | | |
| 252 | | | | | | | | | | | | |
| 253 | | | | | Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | | | | | |
| 254 | | | | KM Mean | 0.681 | | | | KM Standard Error of Mean | | | 0.577 |
| 255 | | | | KM SD | 3.581 | | | | 95% KM (BCA) UCL | | | 1.839 |
| 256 | | | | 95% KM (t) UCL | 1.652 | | | | 95% KM (Percentile Bootstrap) UCL | | | 1.826 |
| 257 | | | | 95% KM (z) UCL | 1.629 | | | | 95% KM Bootstrap t UCL | | | 21.43 |
| 258 | | | | 90% KM Chebyshev UCL | 2.411 | | | | 95% KM Chebyshev UCL | | | 3.194 |
| 259 | | | | 97.5% KM Chebyshev UCL | 4.281 | | | | 99% KM Chebyshev UCL | | | 6.418 |
| 260 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 262 | | | | | A-D Test Statistic | 3.295 | **Anderson-Darling GOF Test** | | | | | |
| 263 | | | | | 5% A-D Critical Value | 0.878 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 264 | | | | | K-S Test Statistic | 0.31 | **Kolmogorov-Smirnov GOF** | | | | | |
| 265 | | | | | 5% K-S Critical Value | 0.182 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 266 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 267 | | | | | | | | | | | | |
| 268 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 269 | | | | | k hat (MLE) | 0.251 | | | k star (bias corrected MLE) | | | 0.248 |
| 270 | | | | | Theta hat (MLE) | 3.866 | | | Theta star (bias corrected MLE) | | | 3.914 |
| 271 | | | | | nu hat (MLE) | 14.08 | | | nu star (bias corrected) | | | 13.9 |
| 272 | | | | | Mean (detects) | 0.972 | | | | | | |
| 273 | | | | | | | | | | | | |
| 274 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 275 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 276 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 277 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 278 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 279 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 280 | | | | | Minimum | 0.0013 | | | Mean | | | 0.683 |
| 281 | | | | | Maximum | 23 | | | Median | | | 0.017 |
| 282 | | | | | SD | 3.626 | | | CV | | | 5.307 |
| 283 | | | | | k hat (MLE) | 0.239 | | | k star (bias corrected MLE) | | | 0.238 |
| 284 | | | | | Theta hat (MLE) | 2.862 | | | Theta star (bias corrected MLE) | | | 2.876 |
| 285 | | | | | nu hat (MLE) | 19.1 | | | nu star (bias corrected) | | | 19 |
| 286 | | | | | Adjusted Level of Significance (β) | 0.044 | | | | | | |
| 287 | | | | | Approximate Chi Square Value (19.00, α) | 10.12 | | | Adjusted Chi Square Value (19.00, β) | | | 9.876 |
| 288 | | | | | 95% Gamma Approximate UCL (use when n>=50) | 1.283 | | | 95% Gamma Adjusted UCL (use when n<50) | | | 1.315 |
| 289 | | | | | | | | | | | | |
| 290 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 291 | | | | | Mean (KM) | 0.681 | | | SD (KM) | | | 3.581 |
| 292 | | | | | Variance (KM) | 12.82 | | | SE of Mean (KM) | | | 0.577 |
| 293 | | | | | k hat (KM) | 0.0362 | | | k star (KM) | | | 0.0501 |
| 294 | | | | | nu hat (KM) | 2.892 | | | nu star (KM) | | | 4.009 |
| 295 | | | | | theta hat (KM) | 18.83 | | | theta star (KM) | | | 13.59 |
| 296 | | | | | 80% gamma percentile (KM) | 0.093 | | | 90% gamma percentile (KM) | | | 1.042 |
| 297 | | | | | 95% gamma percentile (KM) | 3.624 | | | 99% gamma percentile (KM) | | | 14.8 |
| 298 | | | | | | | | | | | | |
| 299 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 300 | | | | | Approximate Chi Square Value (4.01, α) | 0.725 | | | Adjusted Chi Square Value (4.01, β) | | | 0.677 |
| 301 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 3.764 | | | 95% Gamma Adjusted KM-UCL (use when n<50) | | | 4.033 |
| 302 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 303 | | | | | | | | | | | | |
| 304 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 305 | | | | | Shapiro Wilk Test Statistic | 0.942 | **Shapiro Wilk GOF Test** | | | | | |
| 306 | | | | | 5% Shapiro Wilk Critical Value | 0.924 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 307 | | | | | Lilliefors Test Statistic | 0.147 | **Lilliefors GOF Test** | | | | | |
| 308 | | | | | 5% Lilliefors Critical Value | 0.164 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 309 | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 310 | | | | | | | | | | | | |
| 311 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 312 | | | | | Mean in Original Scale | 0.681 | | | Mean in Log Scale | | | -3.87 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 313 | | | | SD in Original Scale | 3.626 | | | | | SD in Log Scale | 2.453 |
| 314 | | | | 95% t UCL (assumes normality of ROS data) | 1.647 | | | | | 95% Percentile Bootstrap UCL | 1.827 |
| 315 | | | | 95% BCA Bootstrap UCL | 2.45 | | | | | 95% Bootstrap t UCL | 20.51 |
| 316 | | | | 95% H-UCL (Log ROS) | 2.446 | | | | | | |
| 317 | | | | | | | | | | | |
| 318 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | |
| 319 | | | | KM Mean (logged) | -3.878 | | | | | KM Geo Mean | 0.0207 |
| 320 | | | | KM SD (logged) | 2.4 | | | | | 95% Critical H Value (KM-Log) | 4.384 |
| 321 | | | | KM Standard Error of Mean (logged) | 0.388 | | | | | 95% H-UCL (KM -Log) | 1.986 |
| 322 | | | | KM SD (logged) | 2.4 | | | | | 95% Critical H Value (KM-Log) | 4.384 |
| 323 | | | | KM Standard Error of Mean (logged) | 0.388 | | | | | | |
| 324 | | | | | | | | | | | |
| 325 | **DL/2 Statistics** | | | | | | | | | | |
| 326 | **DL/2 Normal** | | | | | | | | | **DL/2 Log-Transformed** | |
| 327 | | | | Mean in Original Scale | 0.681 | | | | | Mean in Log Scale | -3.983 |
| 328 | | | | SD in Original Scale | 3.626 | | | | | SD in Log Scale | 2.537 |
| 329 | | | | 95% t UCL (Assumes normality) | 1.647 | | | | | 95% H-Stat UCL | 3.007 |
| 330 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | |
| 331 | | | | | | | | | | | |
| 332 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | |
| 333 | **Detected Data appear Lognormal Distributed at 5% Significance Level** | | | | | | | | | | |
| 334 | | | | | | | | | | | |
| 335 | **Suggested UCL to Use** | | | | | | | | | | |
| 336 | | | | 97.5% KM (Chebyshev) UCL | 4.281 | | | | | | |
| 337 | | | | | | | | | | | |
| 338 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | |
| 339 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | |
| 340 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | |
| 341 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | |
| 342 | | | | | | | | | | | |
| 343 | **Dibenz(a,h)anthracene** | | | | | | | | | | |
| 344 | | | | | | | | | | | |
| 345 | **General Statistics** | | | | | | | | | | |
| 346 | | | | Total Number of Observations | 40 | | | | | Number of Distinct Observations | 25 |
| 347 | | | | Number of Detects | 22 | | | | | Number of Non-Detects | 18 |
| 348 | | | | Number of Distinct Detects | 19 | | | | | Number of Distinct Non-Detects | 8 |
| 349 | | | | Minimum Detect | 0.00168 | | | | | Minimum Non-Detect | 0.0024 |
| 350 | | | | Maximum Detect | 3 | | | | | Maximum Non-Detect | 0.0041 |
| 351 | | | | Variance Detects | 0.403 | | | | | Percent Non-Detects | 45% |
| 352 | | | | Mean Detects | 0.16 | | | | | SD Detects | 0.635 |
| 353 | | | | Median Detects | 0.015 | | | | | CV Detects | 3.963 |
| 354 | | | | Skewness Detects | 4.668 | | | | | Kurtosis Detects | 21.85 |
| 355 | | | | Mean of Logged Detects | -4.06 | | | | | SD of Logged Detects | 1.611 |
| 356 | | | | | | | | | | | |
| 357 | **Normal GOF Test on Detects Only** | | | | | | | | | | |
| 358 | | | | Shapiro Wilk Test Statistic | 0.253 | | | | | **Shapiro Wilk GOF Test** | |
| 359 | | | | 5% Shapiro Wilk Critical Value | 0.911 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 360 | | | | Lilliefors Test Statistic | 0.464 | | | | | **Lilliefors GOF Test** | |
| 361 | | | | 5% Lilliefors Critical Value | 0.184 | | | | | Detected Data Not Normal at 5% Significance Level | |
| 362 | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | | | |
| 363 | | | | | | | | | | | |
| 364 | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 365 | KM Mean | | | | | 0.0891 | KM Standard Error of Mean | | | | | 0.0756 |
| 366 | KM SD | | | | | 0.467 | 95% KM (BCA) UCL | | | | | 0.238 |
| 367 | 95% KM (t) UCL | | | | | 0.216 | 95% KM (Percentile Bootstrap) UCL | | | | | 0.238 |
| 368 | 95% KM (z) UCL | | | | | 0.213 | 95% KM Bootstrap t UCL | | | | | 2.757 |
| 369 | 90% KM Chebyshev UCL | | | | | 0.316 | 95% KM Chebyshev UCL | | | | | 0.418 |
| 370 | 97.5% KM Chebyshev UCL | | | | | 0.561 | 99% KM Chebyshev UCL | | | | | 0.841 |
| 371 | | | | | | | | | | | | |
| 372 | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | | | | |
| 373 | A-D Test Statistic | | | | | 3.852 | **Anderson-Darling GOF Test** | | | | | |
| 374 | 5% A-D Critical Value | | | | | 0.846 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 375 | K-S Test Statistic | | | | | 0.366 | **Kolmogorov-Smirnov GOF** | | | | | |
| 376 | 5% K-S Critical Value | | | | | 0.201 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 377 | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 378 | | | | | | | | | | | | |
| 379 | **Gamma Statistics on Detected Data Only** | | | | | | | | | | | |
| 380 | k hat (MLE) | | | | | 0.308 | k star (bias corrected MLE) | | | | | 0.296 |
| 381 | Theta hat (MLE) | | | | | 0.52 | Theta star (bias corrected MLE) | | | | | 0.541 |
| 382 | nu hat (MLE) | | | | | 13.55 | nu star (bias corrected) | | | | | 13.04 |
| 383 | Mean (detects) | | | | | 0.16 | | | | | | |
| 384 | | | | | | | | | | | | |
| 385 | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | | | | |
| 386 | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | | | | |
| 387 | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | | | | |
| 388 | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | | | | |
| 389 | This is especially true when the sample size is small. | | | | | | | | | | | |
| 390 | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | | | | |
| 391 | Minimum | | | | | 0.00168 | Mean | | | | | 0.0927 |
| 392 | Maximum | | | | | 3 | Median | | | | | 0.01 |
| 393 | SD | | | | | 0.472 | CV | | | | | 5.096 |
| 394 | k hat (MLE) | | | | | 0.349 | k star (bias corrected MLE) | | | | | 0.34 |
| 395 | Theta hat (MLE) | | | | | 0.265 | Theta star (bias corrected MLE) | | | | | 0.273 |
| 396 | nu hat (MLE) | | | | | 27.94 | nu star (bias corrected) | | | | | 27.17 |
| 397 | Adjusted Level of Significance (β) | | | | | 0.044 | | | | | | |
| 398 | Approximate Chi Square Value (27.17, α) | | | | | 16.29 | Adjusted Chi Square Value (27.17, β) | | | | | 15.97 |
| 399 | 95% Gamma Approximate UCL (use when n>=50) | | | | | 0.155 | 95% Gamma Adjusted UCL (use when n<50) | | | | | 0.158 |
| 400 | | | | | | | | | | | | |
| 401 | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | | | | |
| 402 | Mean (KM) | | | | | 0.0891 | SD (KM) | | | | | 0.467 |
| 403 | Variance (KM) | | | | | 0.218 | SE of Mean (KM) | | | | | 0.0756 |
| 404 | k hat (KM) | | | | | 0.0364 | k star (KM) | | | | | 0.0503 |
| 405 | nu hat (KM) | | | | | 2.911 | nu star (KM) | | | | | 4.026 |
| 406 | theta hat (KM) | | | | | 2.448 | theta star (KM) | | | | | 1.77 |
| 407 | 80% gamma percentile (KM) | | | | | 0.0124 | 90% gamma percentile (KM) | | | | | 0.137 |
| 408 | 95% gamma percentile (KM) | | | | | 0.475 | 99% gamma percentile (KM) | | | | | 1.932 |
| 409 | | | | | | | | | | | | |
| 410 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 411 | Approximate Chi Square Value (4.03, α) | | | | | 0.732 | Adjusted Chi Square Value (4.03, β) | | | | | 0.683 |
| 412 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 0.49 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 0.525 |
| 413 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 414 | | | | | | | | | | | | |
| 415 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 416 | Shapiro Wilk Test Statistic | | | | | 0.87 | **Shapiro Wilk GOF Test** | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 417 | | | | 5% Shapiro Wilk Critical Value | | 0.911 | | Detected Data Not Lognormal at 5% Significance Level | | | | |
| 418 | | | | Lilliefors Test Statistic | | 0.192 | | **Lilliefors GOF Test** | | | | |
| 419 | | | | 5% Lilliefors Critical Value | | 0.184 | | Detected Data Not Lognormal at 5% Significance Level | | | | |
| 420 | | | | **Detected Data Not Lognormal at 5% Significance Level** | | | | | | | | |
| 421 | | | | | | | | | | | | |
| 422 | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | |
| 423 | | | | Mean in Original Scale | | 0.0888 | | Mean in Log Scale | | | | -5.249 |
| 424 | | | | SD in Original Scale | | 0.473 | | SD in Log Scale | | | | 1.843 |
| 425 | | | | 95% t UCL (assumes normality of ROS data) | | 0.215 | | 95% Percentile Bootstrap UCL | | | | 0.235 |
| 426 | | | | 95% BCA Bootstrap UCL | | 0.316 | | 95% Bootstrap t UCL | | | | 2.831 |
| 427 | | | | 95% H-UCL (Log ROS) | | 0.0816 | | | | | | |
| 428 | | | | | | | | | | | | |
| 429 | | | | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | |
| 430 | | | | KM Mean (logged) | | -5.029 | | KM Geo Mean | | | | 0.00655 |
| 431 | | | | KM SD (logged) | | 1.588 | | 95% Critical H Value (KM-Log) | | | | 3.172 |
| 432 | | | | KM Standard Error of Mean (logged) | | 0.26 | | 95% H-UCL (KM -Log) | | | | 0.0517 |
| 433 | | | | KM SD (logged) | | 1.588 | | 95% Critical H Value (KM-Log) | | | | 3.172 |
| 434 | | | | KM Standard Error of Mean (logged) | | 0.26 | | | | | | |
| 435 | | | | | | | | | | | | |
| 436 | | | | **DL/2 Statistics** | | | | | | | | |
| 437 | | | | **DL/2 Normal** | | | | **DL/2 Log-Transformed** | | | | |
| 438 | | | | Mean in Original Scale | | 0.0888 | | Mean in Log Scale | | | | -5.197 |
| 439 | | | | SD in Original Scale | | 0.473 | | SD in Log Scale | | | | 1.739 |
| 440 | | | | 95% t UCL (Assumes normality) | | 0.215 | | 95% H-Stat UCL | | | | 0.0644 |
| 441 | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | |
| 442 | | | | | | | | | | | | |
| 443 | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | |
| 444 | | | | **Data do not follow a Discernible Distribution at 5% Significance Level** | | | | | | | | |
| 445 | | | | | | | | | | | | |
| 446 | | | | **Suggested UCL to Use** | | | | | | | | |
| 447 | | | | 95% KM (Chebyshev) UCL | | 0.418 | | | | | | |
| 448 | | | | | | | | | | | | |
| 449 | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | |
| 450 | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | |
| 451 | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | |
| 452 | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | |
| 453 | | | | | | | | | | | | |
| 454 | **Indeno[1,2,3-cd]pyrene** | | | | | | | | | | | |
| 455 | | | | | | | | | | | | |
| 456 | | | | **General Statistics** | | | | | | | | |
| 457 | | | | Total Number of Observations | | 40 | | Number of Distinct Observations | | | | 29 |
| 458 | | | | Number of Detects | | 23 | | Number of Non-Detects | | | | 17 |
| 459 | | | | Number of Distinct Detects | | 22 | | Number of Distinct Non-Detects | | | | 8 |
| 460 | | | | Minimum Detect | | 0.0035 | | Minimum Non-Detect | | | | 0.0024 |
| 461 | | | | Maximum Detect | | 8.4 | | Maximum Non-Detect | | | | 0.0041 |
| 462 | | | | Variance Detects | | 3.027 | | Percent Non-Detects | | | | 42.5% |
| 463 | | | | Mean Detects | | 0.429 | | SD Detects | | | | 1.74 |
| 464 | | | | Median Detects | | 0.043 | | CV Detects | | | | 4.055 |
| 465 | | | | Skewness Detects | | 4.777 | | Kurtosis Detects | | | | 22.87 |
| 466 | | | | Mean of Logged Detects | | -3.106 | | SD of Logged Detects | | | | 1.648 |
| 467 | | | | | | | | | | | | |
| 468 | | | | **Normal GOF Test on Detects Only** | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 469 | | | | Shapiro Wilk Test Statistic | 0.247 | **Shapiro Wilk GOF Test** | | | | | | |
| 470 | | | | 5% Shapiro Wilk Critical Value | 0.914 | Detected Data Not Normal at 5% Significance Level | | | | | | |
| 471 | | | | Lilliefors Test Statistic | 0.465 | **Lilliefors GOF Test** | | | | | | |
| 472 | | | | 5% Lilliefors Critical Value | 0.18 | Detected Data Not Normal at 5% Significance Level | | | | | | |
| 473 | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | |
| 474 | | | | | | | | | | | | |
| 475 | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | |
| 476 | | | | KM Mean | 0.248 | KM Standard Error of Mean | 0.211 | | | | | |
| 477 | | | | KM SD | 1.307 | 95% KM (BCA) UCL | 0.666 | | | | | |
| 478 | | | | 95% KM (t) UCL | 0.604 | 95% KM (Percentile Bootstrap) UCL | 0.66 | | | | | |
| 479 | | | | 95% KM (z) UCL | 0.595 | 95% KM Bootstrap t UCL | 7.93 | | | | | |
| 480 | | | | 90% KM Chebyshev UCL | 0.882 | 95% KM Chebyshev UCL | 1.169 | | | | | |
| 481 | | | | 97.5% KM Chebyshev UCL | 1.568 | 99% KM Chebyshev UCL | 2.351 | | | | | |
| 482 | | | | | | | | | | | | |
| 483 | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | |
| 484 | | | | A-D Test Statistic | 3.807 | **Anderson-Darling GOF Test** | | | | | | |
| 485 | | | | 5% A-D Critical Value | 0.848 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 486 | | | | K-S Test Statistic | 0.351 | **Kolmogorov-Smirnov GOF** | | | | | | |
| 487 | | | | 5% K-S Critical Value | 0.197 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 488 | | | | **Detected Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | |
| 489 | | | | | | | | | | | | |
| 490 | | | | **Gamma Statistics on Detected Data Only** | | | | | | | | |
| 491 | | | | k hat (MLE) | 0.304 | k star (bias corrected MLE) | 0.294 | | | | | |
| 492 | | | | Theta hat (MLE) | 1.41 | Theta star (bias corrected MLE) | 1.461 | | | | | |
| 493 | | | | nu hat (MLE) | 14 | nu star (bias corrected) | 13.51 | | | | | |
| 494 | | | | Mean (detects) | 0.429 | | | | | | | |
| 495 | | | | | | | | | | | | |
| 496 | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | |
| 497 | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | |
| 498 | | | | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | |
| 499 | | | | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | |
| 500 | | | | This is especially true when the sample size is small. | | | | | | | | |
| 501 | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | |
| 502 | | | | Minimum | 0.0035 | Mean | 0.251 | | | | | |
| 503 | | | | Maximum | 8.4 | Median | 0.01 | | | | | |
| 504 | | | | SD | 1.323 | CV | 5.273 | | | | | |
| 505 | | | | k hat (MLE) | 0.293 | k star (bias corrected MLE) | 0.288 | | | | | |
| 506 | | | | Theta hat (MLE) | 0.856 | Theta star (bias corrected MLE) | 0.872 | | | | | |
| 507 | | | | nu hat (MLE) | 23.45 | nu star (bias corrected) | 23.03 | | | | | |
| 508 | | | | Adjusted Level of Significance (β) | 0.044 | | | | | | | |
| 509 | | | | Approximate Chi Square Value (23.03, α) | 13.11 | Adjusted Chi Square Value (23.03, β) | 12.83 | | | | | |
| 510 | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.441 | 95% Gamma Adjusted UCL (use when n<50) | 0.45 | | | | | |
| 511 | | | | | | | | | | | | |
| 512 | | | | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | |
| 513 | | | | Mean (KM) | 0.248 | SD (KM) | 1.307 | | | | | |
| 514 | | | | Variance (KM) | 1.709 | SE of Mean (KM) | 0.211 | | | | | |
| 515 | | | | k hat (KM) | 0.0359 | k star (KM) | 0.0499 | | | | | |
| 516 | | | | nu hat (KM) | 2.873 | nu star (KM) | 3.99 | | | | | |
| 517 | | | | theta hat (KM) | 6.899 | theta star (KM) | 4.966 | | | | | |
| 518 | | | | 80% gamma percentile (KM) | 0.0333 | 90% gamma percentile (KM) | 0.377 | | | | | |
| 519 | | | | 95% gamma percentile (KM) | 1.316 | 99% gamma percentile (KM) | 5.394 | | | | | |
| 520 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 521 | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | | | | | |
| 522 | Approximate Chi Square Value (3.99, α) | | | | | 0.718 | Adjusted Chi Square Value (3.99, β) | | | | | 0.67 |
| 523 | 95% Gamma Approximate KM-UCL (use when n>=50) | | | | | 1.377 | 95% Gamma Adjusted KM-UCL (use when n<50) | | | | | 1.476 |
| 524 | 95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50) | | | | | | | | | | | |
| 525 | | | | | | | | | | | | |
| 526 | **Lognormal GOF Test on Detected Observations Only** | | | | | | | | | | | |
| 527 | Shapiro Wilk Test Statistic | | | | | 0.896 | **Shapiro Wilk GOF Test** | | | | | |
| 528 | 5% Shapiro Wilk Critical Value | | | | | 0.914 | Detected Data Not Lognormal at 5% Significance Level | | | | | |
| 529 | Lilliefors Test Statistic | | | | | 0.162 | **Lilliefors GOF Test** | | | | | |
| 530 | 5% Lilliefors Critical Value | | | | | 0.18 | Detected Data appear Lognormal at 5% Significance Level | | | | | |
| 531 | **Detected Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 532 | | | | | | | | | | | | |
| 533 | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | | | | | |
| 534 | Mean in Original Scale | | | | | 0.247 | Mean in Log Scale | | | | | -4.798 |
| 535 | SD in Original Scale | | | | | 1.324 | SD in Log Scale | | | | | 2.402 |
| 536 | 95% t UCL (assumes normality of ROS data) | | | | | 0.6 | 95% Percentile Bootstrap UCL | | | | | 0.664 |
| 537 | 95% BCA Bootstrap UCL | | | | | 1.063 | 95% Bootstrap t UCL | | | | | 7.37 |
| 538 | 95% H-UCL (Log ROS) | | | | | 0.8 | | | | | | |
| 539 | | | | | | | | | | | | |
| 540 | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | | | | | |
| 541 | KM Mean (logged) | | | | | -4.349 | KM Geo Mean | | | | | 0.0129 |
| 542 | KM SD (logged) | | | | | 1.893 | 95% Critical H Value (KM-Log) | | | | | 3.616 |
| 543 | KM Standard Error of Mean (logged) | | | | | 0.306 | 95% H-UCL (KM -Log) | | | | | 0.232 |
| 544 | KM SD (logged) | | | | | 1.893 | 95% Critical H Value (KM-Log) | | | | | 3.616 |
| 545 | KM Standard Error of Mean (logged) | | | | | 0.306 | | | | | | |
| 546 | | | | | | | | | | | | |
| 547 | **DL/2 Statistics** | | | | | | | | | | | |
| 548 | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | | | | | |
| 549 | Mean in Original Scale | | | | | 0.247 | Mean in Log Scale | | | | | -4.585 |
| 550 | SD in Original Scale | | | | | 1.324 | SD in Log Scale | | | | | 2.138 |
| 551 | 95% t UCL (Assumes normality) | | | | | 0.6 | 95% H-Stat UCL | | | | | 0.392 |
| 552 | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | | | | | |
| 553 | | | | | | | | | | | | |
| 554 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 555 | **Detected Data appear Approximate Lognormal Distributed at 5% Significance Level** | | | | | | | | | | | |
| 556 | | | | | | | | | | | | |
| 557 | **Suggested UCL to Use** | | | | | | | | | | | |
| 558 | 95% KM (Chebyshev) UCL | | | | | 1.169 | | | | | | |
| 559 | | | | | | | | | | | | |
| 560 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 561 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 562 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 563 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 564 | | | | | | | | | | | | |
| 565 | **Arochlor 1260** | | | | | | | | | | | |
| 566 | | | | | | | | | | | | |
| 567 | **General Statistics** | | | | | | | | | | | |
| 568 | Total Number of Observations | | | | | 40 | Number of Distinct Observations | | | | | 32 |
| 569 | Number of Detects | | | | | 18 | Number of Non-Detects | | | | | 22 |
| 570 | Number of Distinct Detects | | | | | 16 | Number of Distinct Non-Detects | | | | | 16 |
| 571 | Minimum Detect | | | | | 0.00758 | Minimum Non-Detect | | | | | 0.0075 |
| 572 | Maximum Detect | | | | | 0.66 | Maximum Non-Detect | | | | | 0.012 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 573 | | | | Variance Detects | 0.0235 | | | | Percent Non-Detects | 55% | | |
| 574 | | | | Mean Detects | 0.0794 | | | | SD Detects | 0.153 | | |
| 575 | | | | Median Detects | 0.024 | | | | CV Detects | 1.93 | | |
| 576 | | | | Skewness Detects | 3.598 | | | | Kurtosis Detects | 13.71 | | |
| 577 | | | | Mean of Logged Detects | -3.339 | | | | SD of Logged Detects | 1.133 | | |
| 578 | | | | | | | | | | | | |
| 579 | | | | **Normal GOF Test on Detects Only** | | | | | | | | |
| 580 | | | | Shapiro Wilk Test Statistic | 0.475 | **Shapiro Wilk GOF Test** | | | | | | |
| 581 | | | | 5% Shapiro Wilk Critical Value | 0.897 | Detected Data Not Normal at 5% Significance Level | | | | | | |
| 582 | | | | Lilliefors Test Statistic | 0.364 | **Lilliefors GOF Test** | | | | | | |
| 583 | | | | 5% Lilliefors Critical Value | 0.202 | Detected Data Not Normal at 5% Significance Level | | | | | | |
| 584 | | | | **Detected Data Not Normal at 5% Significance Level** | | | | | | | | |
| 585 | | | | | | | | | | | | |
| 586 | | | | **Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs** | | | | | | | | |
| 587 | | | | KM Mean | 0.0399 | KM Standard Error of Mean | 0.0173 | | | | | |
| 588 | | | | KM SD | 0.106 | 95% KM (BCA) UCL | 0.0752 | | | | | |
| 589 | | | | 95% KM (t) UCL | 0.069 | 95% KM (Percentile Bootstrap) UCL | 0.073 | | | | | |
| 590 | | | | 95% KM (z) UCL | 0.0683 | 95% KM Bootstrap t UCL | 0.161 | | | | | |
| 591 | | | | 90% KM Chebyshev UCL | 0.0917 | 95% KM Chebyshev UCL | 0.115 | | | | | |
| 592 | | | | 97.5% KM Chebyshev UCL | 0.148 | 99% KM Chebyshev UCL | 0.212 | | | | | |
| 593 | | | | | | | | | | | | |
| 594 | | | | **Gamma GOF Tests on Detected Observations Only** | | | | | | | | |
| 595 | | | | A-D Test Statistic | 1.449 | **Anderson-Darling GOF Test** | | | | | | |
| 596 | | | | 5% A-D Critical Value | 0.779 | Detected Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 597 | | | | K-S Test Statistic | 0.203 | **Kolmogorov-Smirnov GOF** | | | | | | |
| 598 | | | | 5% K-S Critical Value | 0.212 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | | |
| 599 | | | | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | |
| 600 | | | | | | | | | | | | |
| 601 | | | | **Gamma Statistics on Detected Data Only** | | | | | | | | |
| 602 | | | | k hat (MLE) | 0.744 | k star (bias corrected MLE) | 0.657 | | | | | |
| 603 | | | | Theta hat (MLE) | 0.107 | Theta star (bias corrected MLE) | 0.121 | | | | | |
| 604 | | | | nu hat (MLE) | 26.77 | nu star (bias corrected) | 23.64 | | | | | |
| 605 | | | | Mean (detects) | 0.0794 | | | | | | | |
| 606 | | | | | | | | | | | | |
| 607 | | | | **Gamma ROS Statistics using Imputed Non-Detects** | | | | | | | | |
| 608 | | | | GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs | | | | | | | | |
| 609 | | | | GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20) | | | | | | | | |
| 610 | | | | For such situations, GROS method may yield incorrect values of UCLs and BTVs | | | | | | | | |
| 611 | | | | This is especially true when the sample size is small. | | | | | | | | |
| 612 | | | | For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates | | | | | | | | |
| 613 | | | | Minimum | 0.00758 | Mean | 0.0412 | | | | | |
| 614 | | | | Maximum | 0.66 | Median | 0.01 | | | | | |
| 615 | | | | SD | 0.107 | CV | 2.597 | | | | | |
| 616 | | | | k hat (MLE) | 0.712 | k star (bias corrected MLE) | 0.675 | | | | | |
| 617 | | | | Theta hat (MLE) | 0.0579 | Theta star (bias corrected MLE) | 0.0611 | | | | | |
| 618 | | | | nu hat (MLE) | 56.95 | nu star (bias corrected) | 54.01 | | | | | |
| 619 | | | | Adjusted Level of Significance (β) | 0.044 | | | | | | | |
| 620 | | | | Approximate Chi Square Value (54.01, α) | 38.12 | Adjusted Chi Square Value (54.01, β) | 37.62 | | | | | |
| 621 | | | | 95% Gamma Approximate UCL (use when n>=50) | 0.0584 | 95% Gamma Adjusted UCL (use when n<50) | 0.0592 | | | | | |
| 622 | | | | | | | | | | | | |
| 623 | | | | **Estimates of Gamma Parameters using KM Estimates** | | | | | | | | |
| 624 | | | | Mean (KM) | 0.0399 | SD (KM) | 0.106 | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 625 | | | | | Variance (KM) | 0.0113 | | | | | SE of Mean (KM) | 0.0173 |
| 626 | | | | | k hat (KM) | 0.141 | | | | | k star (KM) | 0.147 |
| 627 | | | | | nu hat (KM) | 11.3 | | | | | nu star (KM) | 11.78 |
| 628 | | | | | theta hat (KM) | 0.282 | | | | | theta star (KM) | 0.271 |
| 629 | | | | | 80% gamma percentile (KM) | 0.0428 | | | | | 90% gamma percentile (KM) | 0.118 |
| 630 | | | | | 95% gamma percentile (KM) | 0.22 | | | | | 99% gamma percentile (KM) | 0.518 |
| 631 | | | | | | | | | | | | |
| 632 | | | | | **Gamma Kaplan-Meier (KM) Statistics** | | | | | | | |
| 633 | | | | | Approximate Chi Square Value (11.78, α) | 5.083 | | | | | Adjusted Chi Square Value (11.78, β) | 4.919 |
| 634 | | | | | 95% Gamma Approximate KM-UCL (use when n>=50) | 0.0924 | | | | | 95% Gamma Adjusted KM-UCL (use when n<50) | 0.0955 |
| 635 | | | | | | | | | | | | |
| 636 | | | | | **Lognormal GOF Test on Detected Observations Only** | | | | | | | |
| 637 | | | | | Shapiro Wilk Test Statistic | 0.919 | | | | | **Shapiro Wilk GOF Test** | |
| 638 | | | | | 5% Shapiro Wilk Critical Value | 0.897 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 639 | | | | | Lilliefors Test Statistic | 0.179 | | | | | **Lilliefors GOF Test** | |
| 640 | | | | | 5% Lilliefors Critical Value | 0.202 | | | | | Detected Data appear Lognormal at 5% Significance Level | |
| 641 | | | | | **Detected Data appear Lognormal at 5% Significance Level** | | | | | | | |
| 642 | | | | | | | | | | | | |
| 643 | | | | | **Lognormal ROS Statistics Using Imputed Non-Detects** | | | | | | | |
| 644 | | | | | Mean in Original Scale | 0.037 | | | | | Mean in Log Scale | -4.924 |
| 645 | | | | | SD in Original Scale | 0.108 | | | | | SD in Log Scale | 1.672 |
| 646 | | | | | 95% t UCL (assumes normality of ROS data) | 0.0658 | | | | | 95% Percentile Bootstrap UCL | 0.0677 |
| 647 | | | | | 95% BCA Bootstrap UCL | 0.0928 | | | | | 95% Bootstrap t UCL | 0.155 |
| 648 | | | | | 95% H-UCL (Log ROS) | 0.071 | | | | | | |
| 649 | | | | | | | | | | | | |
| 650 | | | | | **Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution** | | | | | | | |
| 651 | | | | | KM Mean (logged) | -4.191 | | | | | KM Geo Mean | 0.0151 |
| 652 | | | | | KM SD (logged) | 1.067 | | | | | 95% Critical H Value (KM-Log) | 2.487 |
| 653 | | | | | KM Standard Error of Mean (logged) | 0.174 | | | | | 95% H-UCL (KM -Log) | 0.0409 |
| 654 | | | | | KM SD (logged) | 1.067 | | | | | 95% Critical H Value (KM-Log) | 2.487 |
| 655 | | | | | KM Standard Error of Mean (logged) | 0.174 | | | | | | |
| 656 | | | | | | | | | | | | |
| 657 | | | | | **DL/2 Statistics** | | | | | | | |
| 658 | | | | | **DL/2 Normal** | | | | | | **DL/2 Log-Transformed** | |
| 659 | | | | | Mean in Original Scale | 0.038 | | | | | Mean in Log Scale | -4.515 |
| 660 | | | | | SD in Original Scale | 0.108 | | | | | SD in Log Scale | 1.314 |
| 661 | | | | | 95% t UCL (Assumes normality) | 0.0668 | | | | | 95% H-Stat UCL | 0.0467 |
| 662 | | | | | **DL/2 is not a recommended method, provided for comparisons and historical reasons** | | | | | | | |
| 663 | | | | | | | | | | | | |
| 664 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 665 | | | | | **Detected Data appear Approximate Gamma Distributed at 5% Significance Level** | | | | | | | |
| 666 | | | | | | | | | | | | |
| 667 | | | | | **Suggested UCL to Use** | | | | | | | |
| 668 | | | | | Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1) | 0.0955 | | | | | | |
| 669 | | | | | | | | | | | | |
| 670 | | | | | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | |
| 671 | | | | | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | |
| 672 | | | | | | | | | | | | |
| 673 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 674 | | | | | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | |
| 675 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | |
| 676 | | | | | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 677 | | | | | | | | | | | | |
| 678 | | | | | | | | | | | | |
| 679 | **Aluminum** | | | | | | | | | | | |
| 680 | | | | | | | | | | | | |
| 681 | **General Statistics** | | | | | | | | | | | |
| 682 | | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 34 | | |
| 683 | | | | | | | | | Number of Missing Observations | 0 | | |
| 684 | | | | | Minimum | 2400 | | | Mean | 6580 | | |
| 685 | | | | | Maximum | 36000 | | | Median | 5250 | | |
| 686 | | | | | SD | 5459 | | | Std. Error of Mean | 863.1 | | |
| 687 | | | | | Coefficient of Variation | 0.83 | | | Skewness | 4.295 | | |
| 688 | | | | | | | | | | | | |
| 689 | **Normal GOF Test** | | | | | | | | | | | |
| 690 | | | | | Shapiro Wilk Test Statistic | 0.566 | | | **Shapiro Wilk GOF Test** | | | |
| 691 | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | | |
| 692 | | | | | Lilliefors Test Statistic | 0.242 | | | **Lilliefors GOF Test** | | | |
| 693 | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | | |
| 694 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 695 | | | | | | | | | | | | |
| 696 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 697 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 698 | | | | | 95% Student's-t UCL | 8034 | | | 95% Adjusted-CLT UCL (Chen-1995) | 8626 | | |
| 699 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 8132 | | |
| 700 | | | | | | | | | | | | |
| 701 | **Gamma GOF Test** | | | | | | | | | | | |
| 702 | | | | | A-D Test Statistic | 1.606 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 703 | | | | | 5% A-D Critical Value | 0.754 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 704 | | | | | K-S Test Statistic | 0.145 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | | |
| 705 | | | | | 5% K-S Critical Value | 0.14 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 706 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 707 | | | | | | | | | | | | |
| 708 | **Gamma Statistics** | | | | | | | | | | | |
| 709 | | | | | k hat (MLE) | 3.23 | | | k star (bias corrected MLE) | 3.004 | | |
| 710 | | | | | Theta hat (MLE) | 2037 | | | Theta star (bias corrected MLE) | 2190 | | |
| 711 | | | | | nu hat (MLE) | 258.4 | | | nu star (bias corrected) | 240.4 | | |
| 712 | | | | | MLE Mean (bias corrected) | 6580 | | | MLE Sd (bias corrected) | 3796 | | |
| 713 | | | | | | | | | Approximate Chi Square Value (0.05) | 205.5 | | |
| 714 | | | | | Adjusted Level of Significance | 0.044 | | | Adjusted Chi Square Value | 204.3 | | |
| 715 | | | | | | | | | | | | |
| 716 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 717 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 7697 | | | 95% Adjusted Gamma UCL (use when n<50) | 7743 | | |
| 718 | | | | | | | | | | | | |
| 719 | **Lognormal GOF Test** | | | | | | | | | | | |
| 720 | | | | | Shapiro Wilk Test Statistic | 0.925 | | | **Shapiro Wilk Lognormal GOF Test** | | | |
| 721 | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Lognormal at 5% Significance Level | | | |
| 722 | | | | | Lilliefors Test Statistic | 0.106 | | | **Lilliefors Lognormal GOF Test** | | | |
| 723 | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data appear Lognormal at 5% Significance Level | | | |
| 724 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 725 | | | | | | | | | | | | |
| 726 | **Lognormal Statistics** | | | | | | | | | | | |
| 727 | | | | | Minimum of Logged Data | 7.783 | | | Mean of logged Data | 8.629 | | |
| 728 | | | | | Maximum of Logged Data | 10.49 | | | SD of logged Data | 0.511 | | |

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| 729 | | | | | | | | | | | | |
| 730 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 731 | | | | | 95% H-UCL | 7459 | | | 90% Chebyshev (MVUE) UCL | 7961 | | |
| 732 | | | | | 95% Chebyshev (MVUE) UCL | 8692 | | | 97.5% Chebyshev (MVUE) UCL | 9706 | | |
| 733 | | | | | 99% Chebyshev (MVUE) UCL | 11699 | | | | | | |
| 734 | | | | | | | | | | | | |
| 735 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 736 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 737 | | | | | | | | | | | | |
| 738 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 739 | | | | | 95% CLT UCL | 8000 | | | 95% Jackknife UCL | 8034 | | |
| 740 | | | | | 95% Standard Bootstrap UCL | 7930 | | | 95% Bootstrap-t UCL | 9589 | | |
| 741 | | | | | 95% Hall's Bootstrap UCL | 13886 | | | 95% Percentile Bootstrap UCL | 8144 | | |
| 742 | | | | | 95% BCA Bootstrap UCL | 8960 | | | | | | |
| 743 | | | | | 90% Chebyshev(Mean, Sd) UCL | 9169 | | | 95% Chebyshev(Mean, Sd) UCL | 10342 | | |
| 744 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 11970 | | | 99% Chebyshev(Mean, Sd) UCL | 15168 | | |
| 745 | | | | | | | | | | | | |
| 746 | **Suggested UCL to Use** | | | | | | | | | | | |
| 747 | | | | | 95% H-UCL | 7459 | | | | | | |
| 748 | | | | | | | | | | | | |
| 749 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 750 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 751 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 752 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 753 | | | | | | | | | | | | |
| 754 | **ProUCL computes and outputs H-statistic based UCLs for historical reasons only.** | | | | | | | | | | | |
| 755 | **H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.** | | | | | | | | | | | |
| 756 | **It is therefore recommended to avoid the use of H-statistic based 95% UCLs.** | | | | | | | | | | | |
| 757 | **Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.** | | | | | | | | | | | |
| 758 | | | | | | | | | | | | |
| 759 | | | | | | | | | | | | |
| 760 | **Arsenic** | | | | | | | | | | | |
| 761 | | | | | | | | | | | | |
| 762 | **General Statistics** | | | | | | | | | | | |
| 763 | | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 25 | | |
| 764 | | | | | | | | | Number of Missing Observations | 0 | | |
| 765 | | | | | Minimum | 1.2 | | | Mean | 2.933 | | |
| 766 | | | | | Maximum | 8.3 | | | Median | 2.5 | | |
| 767 | | | | | SD | 1.409 | | | Std. Error of Mean | 0.223 | | |
| 768 | | | | | Coefficient of Variation | 0.48 | | | Skewness | 1.782 | | |
| 769 | | | | | | | | | | | | |
| 770 | **Normal GOF Test** | | | | | | | | | | | |
| 771 | | | | | Shapiro Wilk Test Statistic | 0.84 | | | **Shapiro Wilk GOF Test** | | | |
| 772 | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | | |
| 773 | | | | | Lilliefors Test Statistic | 0.181 | | | **Lilliefors GOF Test** | | | |
| 774 | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | | |
| 775 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 776 | | | | | | | | | | | | |
| 777 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 778 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 779 | | | | | 95% Student's-t UCL | 3.308 | | | 95% Adjusted-CLT UCL (Chen-1995) | 3.366 | | |
| 780 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 3.318 | | |

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| 781 | | | | | | | | | | | | |
| 782 | **Gamma GOF Test** | | | | | | | | | | | |
| 783 | | | | | A-D Test Statistic | 0.952 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 784 | | | | | 5% A-D Critical Value | 0.751 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 785 | | | | | K-S Test Statistic | 0.139 | **Kolmogorov-Smirnov Gamma GOF Test** | | | | | |
| 786 | | | | | 5% K-S Critical Value | 0.14 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 787 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 788 | | | | | | | | | | | | |
| 789 | **Gamma Statistics** | | | | | | | | | | | |
| 790 | | | | | k hat (MLE) | 5.616 | k star (bias corrected MLE) | 5.212 | | | | |
| 791 | | | | | Theta hat (MLE) | 0.522 | Theta star (bias corrected MLE) | 0.563 | | | | |
| 792 | | | | | nu hat (MLE) | 449.3 | nu star (bias corrected) | 416.9 | | | | |
| 793 | | | | | MLE Mean (bias corrected) | 2.933 | MLE Sd (bias corrected) | 1.285 | | | | |
| 794 | | | | | | | Approximate Chi Square Value (0.05) | 370.6 | | | | |
| 795 | | | | | Adjusted Level of Significance | 0.044 | Adjusted Chi Square Value | 369 | | | | |
| 796 | | | | | | | | | | | | |
| 797 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 798 | | | | 95% Approximate Gamma UCL (use when n>=50) | | 3.299 | 95% Adjusted Gamma UCL (use when n<50) | 3.314 | | | | |
| 799 | | | | | | | | | | | | |
| 800 | **Lognormal GOF Test** | | | | | | | | | | | |
| 801 | | | | | Shapiro Wilk Test Statistic | 0.962 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 802 | | | | | 5% Shapiro Wilk Critical Value | 0.94 | Data appear Lognormal at 5% Significance Level | | | | | |
| 803 | | | | | Lilliefors Test Statistic | 0.114 | **Lilliefors Lognormal GOF Test** | | | | | |
| 804 | | | | | 5% Lilliefors Critical Value | 0.139 | Data appear Lognormal at 5% Significance Level | | | | | |
| 805 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 806 | | | | | | | | | | | | |
| 807 | **Lognormal Statistics** | | | | | | | | | | | |
| 808 | | | | | Minimum of Logged Data | 0.182 | Mean of logged Data | 0.984 | | | | |
| 809 | | | | | Maximum of Logged Data | 2.116 | SD of logged Data | 0.42 | | | | |
| 810 | | | | | | | | | | | | |
| 811 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 812 | | | | | 95% H-UCL | 3.311 | 90% Chebyshev (MVUE) UCL | 3.515 | | | | |
| 813 | | | | | 95% Chebyshev (MVUE) UCL | 3.787 | 97.5% Chebyshev (MVUE) UCL | 4.164 | | | | |
| 814 | | | | | 99% Chebyshev (MVUE) UCL | 4.905 | | | | | | |
| 815 | | | | | | | | | | | | |
| 816 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 817 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 818 | | | | | | | | | | | | |
| 819 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 820 | | | | | 95% CLT UCL | 3.299 | 95% Jackknife UCL | 3.308 | | | | |
| 821 | | | | | 95% Standard Bootstrap UCL | 3.296 | 95% Bootstrap-t UCL | 3.406 | | | | |
| 822 | | | | | 95% Hall's Bootstrap UCL | 3.396 | 95% Percentile Bootstrap UCL | 3.313 | | | | |
| 823 | | | | | 95% BCA Bootstrap UCL | 3.343 | | | | | | |
| 824 | | | | | 90% Chebyshev(Mean, Sd) UCL | 3.601 | 95% Chebyshev(Mean, Sd) UCL | 3.903 | | | | |
| 825 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 4.324 | 99% Chebyshev(Mean, Sd) UCL | 5.149 | | | | |
| 826 | | | | | | | | | | | | |
| 827 | **Suggested UCL to Use** | | | | | | | | | | | |
| 828 | | | | | 95% Adjusted Gamma UCL | 3.314 | | | | | | |
| 829 | | | | | | | | | | | | |
| 830 | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | | | | | |
| 831 | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | | | | | |
| 832 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 833 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 834 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 835 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 836 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 837 | | | | | | | | | | | | |
| 838 | | | | | | | | | | | | |
| 839 | **Chromium** | | | | | | | | | | | |
| 840 | | | | | | | | | | | | |
| 841 | **General Statistics** | | | | | | | | | | | |
| 842 | | | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 32 | |
| 843 | | | | | | | | | | Number of Missing Observations | 0 | |
| 844 | | | | | | Minimum | 2.8 | | | Mean | 8.029 | |
| 845 | | | | | | Maximum | 38 | | | Median | 5.75 | |
| 846 | | | | | | SD | 6.427 | | | Std. Error of Mean | 1.016 | |
| 847 | | | | | | Coefficient of Variation | 0.801 | | | Skewness | 3.194 | |
| 848 | | | | | | | | | | | | |
| 849 | **Normal GOF Test** | | | | | | | | | | | |
| 850 | | | | | | Shapiro Wilk Test Statistic | 0.666 | | | **Shapiro Wilk GOF Test** | | |
| 851 | | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | |
| 852 | | | | | | Lilliefors Test Statistic | 0.255 | | | **Lilliefors GOF Test** | | |
| 853 | | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | |
| 854 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 855 | | | | | | | | | | | | |
| 856 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 857 | | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | |
| 858 | | | | | | 95% Student's-t UCL | 9.741 | | | 95% Adjusted-CLT UCL (Chen-1995) | 10.25 | |
| 859 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 9.827 | |
| 860 | | | | | | | | | | | | |
| 861 | **Gamma GOF Test** | | | | | | | | | | | |
| 862 | | | | | | A-D Test Statistic | 1.22 | | | **Anderson-Darling Gamma GOF Test** | | |
| 863 | | | | | | 5% A-D Critical Value | 0.755 | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 864 | | | | | | K-S Test Statistic | 0.156 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | |
| 865 | | | | | | 5% K-S Critical Value | 0.141 | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 866 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 867 | | | | | | | | | | | | |
| 868 | **Gamma Statistics** | | | | | | | | | | | |
| 869 | | | | | | k hat (MLE) | 2.838 | | | k star (bias corrected MLE) | 2.642 | |
| 870 | | | | | | Theta hat (MLE) | 2.829 | | | Theta star (bias corrected MLE) | 3.039 | |
| 871 | | | | | | nu hat (MLE) | 227.1 | | | nu star (bias corrected) | 211.4 | |
| 872 | | | | | | MLE Mean (bias corrected) | 8.029 | | | MLE Sd (bias corrected) | 4.939 | |
| 873 | | | | | | | | | | Approximate Chi Square Value (0.05) | 178.7 | |
| 874 | | | | | | Adjusted Level of Significance | 0.044 | | | Adjusted Chi Square Value | 177.6 | |
| 875 | | | | | | | | | | | | |
| 876 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 877 | | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 9.495 | | | 95% Adjusted Gamma UCL (use when n<50) | 9.555 | |
| 878 | | | | | | | | | | | | |
| 879 | **Lognormal GOF Test** | | | | | | | | | | | |
| 880 | | | | | | Shapiro Wilk Test Statistic | 0.943 | | | **Shapiro Wilk Lognormal GOF Test** | | |
| 881 | | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data appear Lognormal at 5% Significance Level | | |
| 882 | | | | | | Lilliefors Test Statistic | 0.121 | | | **Lilliefors Lognormal GOF Test** | | |
| 883 | | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data appear Lognormal at 5% Significance Level | | |
| 884 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 885 | | | | | | | | | | | | |
| 886 | **Lognormal Statistics** | | | | | | | | | | | |
| 887 | | | | | Minimum of Logged Data | 1.03 | | | Mean of logged Data | 1.897 | | |
| 888 | | | | | Maximum of Logged Data | 3.638 | | | SD of logged Data | 0.569 | | |
| 889 | | | | | | | | | | | | |
| 890 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 891 | | | | | 95% H-UCL | 9.377 | | | 90% Chebyshev (MVUE) UCL | 10.03 | | |
| 892 | | | | | 95% Chebyshev (MVUE) UCL | 11.04 | | | 97.5% Chebyshev (MVUE) UCL | 12.44 | | |
| 893 | | | | | 99% Chebyshev (MVUE) UCL | 15.2 | | | | | | |
| 894 | | | | | | | | | | | | |
| 895 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 896 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 897 | | | | | | | | | | | | |
| 898 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 899 | | | | | 95% CLT UCL | 9.7 | | | 95% Jackknife UCL | 9.741 | | |
| 900 | | | | | 95% Standard Bootstrap UCL | 9.654 | | | 95% Bootstrap-t UCL | 10.89 | | |
| 901 | | | | | 95% Hall's Bootstrap UCL | 18.32 | | | 95% Percentile Bootstrap UCL | 9.758 | | |
| 902 | | | | | 95% BCA Bootstrap UCL | 10.16 | | | | | | |
| 903 | | | | | 90% Chebyshev(Mean, Sd) UCL | 11.08 | | | 95% Chebyshev(Mean, Sd) UCL | 12.46 | | |
| 904 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 14.38 | | | 99% Chebyshev(Mean, Sd) UCL | 18.14 | | |
| 905 | | | | | | | | | | | | |
| 906 | **Suggested UCL to Use** | | | | | | | | | | | |
| 907 | | | | | 95% H-UCL | 9.377 | | | | | | |
| 908 | | | | | | | | | | | | |
| 909 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 910 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 911 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 912 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 913 | | | | | | | | | | | | |
| 914 | **ProUCL computes and outputs H-statistic based UCLs for historical reasons only.** | | | | | | | | | | | |
| 915 | **H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.** | | | | | | | | | | | |
| 916 | **It is therefore recommended to avoid the use of H-statistic based 95% UCLs.** | | | | | | | | | | | |
| 917 | **Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.** | | | | | | | | | | | |
| 918 | | | | | | | | | | | | |
| 919 | | | | | | | | | | | | |
| 920 | **Cobalt** | | | | | | | | | | | |
| 921 | | | | | | | | | | | | |
| 922 | **General Statistics** | | | | | | | | | | | |
| 923 | | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 26 | | |
| 924 | | | | | | | | | Number of Missing Observations | 0 | | |
| 925 | | | | | Minimum | 1.9 | | | Mean | 4.063 | | |
| 926 | | | | | Maximum | 11 | | | Median | 3.25 | | |
| 927 | | | | | SD | 2.188 | | | Std. Error of Mean | 0.346 | | |
| 928 | | | | | Coefficient of Variation | 0.539 | | | Skewness | 1.803 | | |
| 929 | | | | | | | | | | | | |
| 930 | **Normal GOF Test** | | | | | | | | | | | |
| 931 | | | | | Shapiro Wilk Test Statistic | 0.793 | | | **Shapiro Wilk GOF Test** | | | |
| 932 | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | | |
| 933 | | | | | Lilliefors Test Statistic | 0.219 | | | **Lilliefors GOF Test** | | | |
| 934 | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | | |
| 935 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 936 | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 937 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 938 | **95% Normal UCL** | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | | |
| 939 | | | | 95% Student's-t UCL | 4.645 | | | | 95% Adjusted-CLT UCL (Chen-1995) | 4.737 | | |
| 940 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 4.662 | | |
| 941 | | | | | | | | | | | | |
| 942 | **Gamma GOF Test** | | | | | | | | | | | |
| 943 | | | | A-D Test Statistic | 1.388 | **Anderson-Darling Gamma GOF Test** | | | | | | |
| 944 | | | | 5% A-D Critical Value | 0.752 | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 945 | | | | K-S Test Statistic | 0.186 | **Kolmogorov-Smirnov Gamma GOF Test** | | | | | | |
| 946 | | | | 5% K-S Critical Value | 0.14 | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 947 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 948 | | | | | | | | | | | | |
| 949 | **Gamma Statistics** | | | | | | | | | | | |
| 950 | | | | k hat (MLE) | 4.704 | k star (bias corrected MLE) | 4.368 | | | | | |
| 951 | | | | Theta hat (MLE) | 0.864 | Theta star (bias corrected MLE) | 0.93 | | | | | |
| 952 | | | | nu hat (MLE) | 376.3 | nu star (bias corrected) | 349.5 | | | | | |
| 953 | | | | MLE Mean (bias corrected) | 4.063 | MLE Sd (bias corrected) | 1.944 | | | | | |
| 954 | | | | | | Approximate Chi Square Value (0.05) | 307.1 | | | | | |
| 955 | | | | Adjusted Level of Significance | 0.044 | Adjusted Chi Square Value | 305.7 | | | | | |
| 956 | | | | | | | | | | | | |
| 957 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 958 | | | | 95% Approximate Gamma UCL (use when n>=50)) | 4.622 | 95% Adjusted Gamma UCL (use when n<50) | 4.645 | | | | | |
| 959 | | | | | | | | | | | | |
| 960 | **Lognormal GOF Test** | | | | | | | | | | | |
| 961 | | | | Shapiro Wilk Test Statistic | 0.923 | **Shapiro Wilk Lognormal GOF Test** | | | | | | |
| 962 | | | | 5% Shapiro Wilk Critical Value | 0.94 | Data Not Lognormal at 5% Significance Level | | | | | | |
| 963 | | | | Lilliefors Test Statistic | 0.161 | **Lilliefors Lognormal GOF Test** | | | | | | |
| 964 | | | | 5% Lilliefors Critical Value | 0.139 | Data Not Lognormal at 5% Significance Level | | | | | | |
| 965 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 966 | | | | | | | | | | | | |
| 967 | **Lognormal Statistics** | | | | | | | | | | | |
| 968 | | | | Minimum of Logged Data | 0.642 | Mean of logged Data | 1.292 | | | | | |
| 969 | | | | Maximum of Logged Data | 2.398 | SD of logged Data | 0.452 | | | | | |
| 970 | | | | | | | | | | | | |
| 971 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 972 | | | | 95% H-UCL | 4.621 | 90% Chebyshev (MVUE) UCL | 4.916 | | | | | |
| 973 | | | | 95% Chebyshev (MVUE) UCL | 5.322 | 97.5% Chebyshev (MVUE) UCL | 5.885 | | | | | |
| 974 | | | | 99% Chebyshev (MVUE) UCL | 6.992 | | | | | | | |
| 975 | | | | | | | | | | | | |
| 976 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 977 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 978 | | | | | | | | | | | | |
| 979 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 980 | | | | 95% CLT UCL | 4.632 | 95% Jackknife UCL | 4.645 | | | | | |
| 981 | | | | 95% Standard Bootstrap UCL | 4.628 | 95% Bootstrap-t UCL | 4.799 | | | | | |
| 982 | | | | 95% Hall's Bootstrap UCL | 4.753 | 95% Percentile Bootstrap UCL | 4.636 | | | | | |
| 983 | | | | 95% BCA Bootstrap UCL | 4.78 | | | | | | | |
| 984 | | | | 90% Chebyshev(Mean, Sd) UCL | 5.1 | 95% Chebyshev(Mean, Sd) UCL | 5.571 | | | | | |
| 985 | | | | 97.5% Chebyshev(Mean, Sd) UCL | 6.223 | 99% Chebyshev(Mean, Sd) UCL | 7.505 | | | | | |
| 986 | | | | | | | | | | | | |
| 987 | **Suggested UCL to Use** | | | | | | | | | | | |
| 988 | | | | 95% Student's-t UCL | 4.645 | or 95% Modified-t UCL | 4.662 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 989 | | | | | | | | | | | | |
| 990 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 991 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 992 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 993 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 994 | | | | | | | | | | | | |
| 995 | | | | | | | | | | | | |
| 996 | **Iron** | | | | | | | | | | | |
| 997 | | | | | | | | | | | | |
| 998 | **General Statistics** | | | | | | | | | | | |
| 999 | | | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 27 | |
| 1000 | | | | | | | | | | Number of Missing Observations | 0 | |
| 1001 | | | | | | Minimum | 5600 | | | Mean | 11678 | |
| 1002 | | | | | | Maximum | 26000 | | | Median | 9400 | |
| 1003 | | | | | | SD | 5293 | | | Std. Error of Mean | 836.9 | |
| 1004 | | | | | | Coefficient of Variation | 0.453 | | | Skewness | 1.196 | |
| 1005 | | | | | | | | | | | | |
| 1006 | **Normal GOF Test** | | | | | | | | | | | |
| 1007 | | | | | | Shapiro Wilk Test Statistic | 0.863 | | | **Shapiro Wilk GOF Test** | | |
| 1008 | | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | |
| 1009 | | | | | | Lilliefors Test Statistic | 0.199 | | | **Lilliefors GOF Test** | | |
| 1010 | | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | |
| 1011 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1012 | | | | | | | | | | | | |
| 1013 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1014 | | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | |
| 1015 | | | | | | 95% Student's-t UCL | 13088 | | | 95% Adjusted-CLT UCL (Chen-1995) | 13223 | |
| 1016 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 13114 | |
| 1017 | | | | | | | | | | | | |
| 1018 | **Gamma GOF Test** | | | | | | | | | | | |
| 1019 | | | | | | A-D Test Statistic | 1.062 | | | **Anderson-Darling Gamma GOF Test** | | |
| 1020 | | | | | | 5% A-D Critical Value | 0.751 | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 1021 | | | | | | K-S Test Statistic | 0.168 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | |
| 1022 | | | | | | 5% K-S Critical Value | 0.14 | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 1023 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1024 | | | | | | | | | | | | |
| 1025 | **Gamma Statistics** | | | | | | | | | | | |
| 1026 | | | | | | k hat (MLE) | 5.862 | | | k star (bias corrected MLE) | 5.439 | |
| 1027 | | | | | | Theta hat (MLE) | 1992 | | | Theta star (bias corrected MLE) | 2147 | |
| 1028 | | | | | | nu hat (MLE) | 469 | | | nu star (bias corrected) | 435.1 | |
| 1029 | | | | | | MLE Mean (bias corrected) | 11678 | | | MLE Sd (bias corrected) | 5007 | |
| 1030 | | | | | | | | | | Approximate Chi Square Value (0.05) | 387.8 | |
| 1031 | | | | | | Adjusted Level of Significance | 0.044 | | | Adjusted Chi Square Value | 386.1 | |
| 1032 | | | | | | | | | | | | |
| 1033 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1034 | | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 13104 | | | 95% Adjusted Gamma UCL (use when n<50) | 13160 | |
| 1035 | | | | | | | | | | | | |
| 1036 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1037 | | | | | | Shapiro Wilk Test Statistic | 0.941 | | | **Shapiro Wilk Lognormal GOF Test** | | |
| 1038 | | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data appear Lognormal at 5% Significance Level | | |
| 1039 | | | | | | Lilliefors Test Statistic | 0.148 | | | **Lilliefors Lognormal GOF Test** | | |
| 1040 | | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Lognormal at 5% Significance Level | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1041 | **Data appear Approximate Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1042 | | | | | | | | | | | | |
| 1043 | **Lognormal Statistics** | | | | | | | | | | | |
| 1044 | | | | | | Minimum of Logged Data | 8.631 | | | Mean of logged Data | 9.278 | |
| 1045 | | | | | | Maximum of Logged Data | 10.17 | | | SD of logged Data | 0.413 | |
| 1046 | | | | | | | | | | | | |
| 1047 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1048 | | | | | | 95% H-UCL | 13175 | | | 90% Chebyshev (MVUE) UCL | 13978 | |
| 1049 | | | | | | 95% Chebyshev (MVUE) UCL | 15044 | | | 97.5% Chebyshev (MVUE) UCL | 16524 | |
| 1050 | | | | | | 99% Chebyshev (MVUE) UCL | 19432 | | | | | |
| 1051 | | | | | | | | | | | | |
| 1052 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1053 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1054 | | | | | | | | | | | | |
| 1055 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1056 | | | | | | 95% CLT UCL | 13054 | | | 95% Jackknife UCL | 13088 | |
| 1057 | | | | | | 95% Standard Bootstrap UCL | 13051 | | | 95% Bootstrap-t UCL | 13381 | |
| 1058 | | | | | | 95% Hall's Bootstrap UCL | 13369 | | | 95% Percentile Bootstrap UCL | 13058 | |
| 1059 | | | | | | 95% BCA Bootstrap UCL | 13200 | | | | | |
| 1060 | | | | | | 90% Chebyshev(Mean, Sd) UCL | 14188 | | | 95% Chebyshev(Mean, Sd) UCL | 15326 | |
| 1061 | | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 16904 | | | 99% Chebyshev(Mean, Sd) UCL | 20005 | |
| 1062 | | | | | | | | | | | | |
| 1063 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1064 | | | | | | 95% Student's-t UCL | 13088 | | | or 95% Modified-t UCL | 13114 | |
| 1065 | | | | | | or 95% H-UCL | 13175 | | | | | |
| 1066 | | | | | | | | | | | | |
| 1067 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1068 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1069 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1070 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1071 | | | | | | | | | | | | |
| 1072 | **ProUCL computes and outputs H-statistic based UCLs for historical reasons only.** | | | | | | | | | | | |
| 1073 | **H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.** | | | | | | | | | | | |
| 1074 | **It is therefore recommended to avoid the use of H-statistic based 95% UCLs.** | | | | | | | | | | | |
| 1075 | **Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.** | | | | | | | | | | | |
| 1076 | | | | | | | | | | | | |
| 1077 | | | | | | | | | | | | |
| 1078 | **Manganese** | | | | | | | | | | | |
| 1079 | | | | | | | | | | | | |
| 1080 | **General Statistics** | | | | | | | | | | | |
| 1081 | | | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 26 | |
| 1082 | | | | | | | | | | Number of Missing Observations | 0 | |
| 1083 | | | | | | Minimum | 100 | | | Mean | 298.1 | |
| 1084 | | | | | | Maximum | 880 | | | Median | 265 | |
| 1085 | | | | | | SD | 164.7 | | | Std. Error of Mean | 26.04 | |
| 1086 | | | | | | Coefficient of Variation | 0.552 | | | Skewness | 1.983 | |
| 1087 | | | | | | | | | | | | |
| 1088 | **Normal GOF Test** | | | | | | | | | | | |
| 1089 | | | | | | Shapiro Wilk Test Statistic | 0.808 | | | **Shapiro Wilk GOF Test** | | |
| 1090 | | | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | |
| 1091 | | | | | | Lilliefors Test Statistic | 0.221 | | | **Lilliefors GOF Test** | | |
| 1092 | | | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1093 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1094 | | | | | | | | | | | | |
| 1095 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1096 | **95% Normal UCL** | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | | |
| 1097 | 95% Student's-t UCL | | | 342 | | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 349.7 | |
| 1098 | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 343.4 | |
| 1099 | | | | | | | | | | | | |
| 1100 | **Gamma GOF Test** | | | | | | | | | | | |
| 1101 | A-D Test Statistic | | | 0.833 | | **Anderson-Darling Gamma GOF Test** | | | | | | |
| 1102 | 5% A-D Critical Value | | | 0.752 | | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 1103 | K-S Test Statistic | | | 0.155 | | **Kolmogorov-Smirnov Gamma GOF Test** | | | | | | |
| 1104 | 5% K-S Critical Value | | | 0.14 | | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 1105 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 1106 | | | | | | | | | | | | |
| 1107 | **Gamma Statistics** | | | | | | | | | | | |
| 1108 | k hat (MLE) | | | 4.405 | | k star (bias corrected MLE) | | | | | 4.091 | |
| 1109 | Theta hat (MLE) | | | 67.68 | | Theta star (bias corrected MLE) | | | | | 72.87 | |
| 1110 | nu hat (MLE) | | | 352.4 | | nu star (bias corrected) | | | | | 327.3 | |
| 1111 | MLE Mean (bias corrected) | | | 298.1 | | MLE Sd (bias corrected) | | | | | 147.4 | |
| 1112 | | | | | | Approximate Chi Square Value (0.05) | | | | | 286.4 | |
| 1113 | Adjusted Level of Significance | | | 0.044 | | Adjusted Chi Square Value | | | | | 284.9 | |
| 1114 | | | | | | | | | | | | |
| 1115 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1116 | 95% Approximate Gamma UCL (use when n>=50)) | | | 340.7 | | 95% Adjusted Gamma UCL (use when n<50) | | | | | 342.4 | |
| 1117 | | | | | | | | | | | | |
| 1118 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1119 | Shapiro Wilk Test Statistic | | | 0.966 | | **Shapiro Wilk Lognormal GOF Test** | | | | | | |
| 1120 | 5% Shapiro Wilk Critical Value | | | 0.94 | | Data appear Lognormal at 5% Significance Level | | | | | | |
| 1121 | Lilliefors Test Statistic | | | 0.121 | | **Lilliefors Lognormal GOF Test** | | | | | | |
| 1122 | 5% Lilliefors Critical Value | | | 0.139 | | Data appear Lognormal at 5% Significance Level | | | | | | |
| 1123 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1124 | | | | | | | | | | | | |
| 1125 | **Lognormal Statistics** | | | | | | | | | | | |
| 1126 | Minimum of Logged Data | | | 4.605 | | Mean of logged Data | | | | | 5.58 | |
| 1127 | Maximum of Logged Data | | | 6.78 | | SD of logged Data | | | | | 0.478 | |
| 1128 | | | | | | | | | | | | |
| 1129 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1130 | 95% H-UCL | | | 343.6 | | 90% Chebyshev (MVUE) UCL | | | | | 366.1 | |
| 1131 | 95% Chebyshev (MVUE) UCL | | | 397.9 | | 97.5% Chebyshev (MVUE) UCL | | | | | 441.9 | |
| 1132 | 99% Chebyshev (MVUE) UCL | | | 528.4 | | | | | | | | |
| 1133 | | | | | | | | | | | | |
| 1134 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1135 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1136 | | | | | | | | | | | | |
| 1137 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1138 | 95% CLT UCL | | | 341 | | 95% Jackknife UCL | | | | | 342 | |
| 1139 | 95% Standard Bootstrap UCL | | | 341.1 | | 95% Bootstrap-t UCL | | | | | 362.1 | |
| 1140 | 95% Hall's Bootstrap UCL | | | 361.6 | | 95% Percentile Bootstrap UCL | | | | | 339.4 | |
| 1141 | 95% BCA Bootstrap UCL | | | 347.3 | | | | | | | | |
| 1142 | 90% Chebyshev(Mean, Sd) UCL | | | 376.2 | | 95% Chebyshev(Mean, Sd) UCL | | | | | 411.6 | |
| 1143 | 97.5% Chebyshev(Mean, Sd) UCL | | | 460.7 | | 99% Chebyshev(Mean, Sd) UCL | | | | | 557.2 | |
| 1144 | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1145 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1146 | | | | 95% Student's-t UCL | 342 | | | or 95% Modified-t UCL | 343.4 | | | |
| 1147 | | | | or 95% H-UCL | 343.6 | | | | | | | |
| 1148 | | | | | | | | | | | | |
| 1149 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1150 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1151 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1152 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1153 | | | | | | | | | | | | |
| 1154 | **ProUCL computes and outputs H-statistic based UCLs for historical reasons only.** | | | | | | | | | | | |
| 1155 | **H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.** | | | | | | | | | | | |
| 1156 | **It is therefore recommended to avoid the use of H-statistic based 95% UCLs.** | | | | | | | | | | | |
| 1157 | **Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.** | | | | | | | | | | | |
| 1158 | | | | | | | | | | | | |
| 1159 | | | | | | | | | | | | |
| 1160 | **Vanadium** | | | | | | | | | | | |
| 1161 | | | | | | | | | | | | |
| 1162 | **General Statistics** | | | | | | | | | | | |
| 1163 | | | | Total Number of Observations | 40 | | | Number of Distinct Observations | 33 | | | |
| 1164 | | | | | | | | Number of Missing Observations | 0 | | | |
| 1165 | | | | Minimum | 4.5 | | | Mean | 11.54 | | | |
| 1166 | | | | Maximum | 48 | | | Median | 9.55 | | | |
| 1167 | | | | SD | 7.924 | | | Std. Error of Mean | 1.253 | | | |
| 1168 | | | | Coefficient of Variation | 0.687 | | | Skewness | 3.095 | | | |
| 1169 | | | | | | | | | | | | |
| 1170 | **Normal GOF Test** | | | | | | | | | | | |
| 1171 | | | | Shapiro Wilk Test Statistic | 0.686 | | | **Shapiro Wilk GOF Test** | | | | |
| 1172 | | | | 5% Shapiro Wilk Critical Value | 0.94 | | | Data Not Normal at 5% Significance Level | | | | |
| 1173 | | | | Lilliefors Test Statistic | 0.212 | | | **Lilliefors GOF Test** | | | | |
| 1174 | | | | 5% Lilliefors Critical Value | 0.139 | | | Data Not Normal at 5% Significance Level | | | | |
| 1175 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 1176 | | | | | | | | | | | | |
| 1177 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 1178 | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | | |
| 1179 | | | | 95% Student's-t UCL | 13.65 | | | 95% Adjusted-CLT UCL (Chen-1995) | 14.25 | | | |
| 1180 | | | | | | | | 95% Modified-t UCL (Johnson-1978) | 13.75 | | | |
| 1181 | | | | | | | | | | | | |
| 1182 | **Gamma GOF Test** | | | | | | | | | | | |
| 1183 | | | | A-D Test Statistic | 1.081 | | | **Anderson-Darling Gamma GOF Test** | | | | |
| 1184 | | | | 5% A-D Critical Value | 0.753 | | | Data Not Gamma Distributed at 5% Significance Level | | | | |
| 1185 | | | | K-S Test Statistic | 0.128 | | | **Kolmogorov-Smirnov Gamma GOF Test** | | | | |
| 1186 | | | | 5% K-S Critical Value | 0.14 | | | Detected data appear Gamma Distributed at 5% Significance Level | | | | |
| 1187 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1188 | | | | | | | | | | | | |
| 1189 | **Gamma Statistics** | | | | | | | | | | | |
| 1190 | | | | k hat (MLE) | 3.648 | | | k star (bias corrected MLE) | 3.391 | | | |
| 1191 | | | | Theta hat (MLE) | 3.163 | | | Theta star (bias corrected MLE) | 3.403 | | | |
| 1192 | | | | nu hat (MLE) | 291.8 | | | nu star (bias corrected) | 271.3 | | | |
| 1193 | | | | MLE Mean (bias corrected) | 11.54 | | | MLE Sd (bias corrected) | 6.266 | | | |
| 1194 | | | | | | | | Approximate Chi Square Value (0.05) | 234.1 | | | |
| 1195 | | | | Adjusted Level of Significance | 0.044 | | | Adjusted Chi Square Value | 232.8 | | | |
| 1196 | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1197 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 1198 | 95% Approximate Gamma UCL (use when n>=50) | | | | | 13.37 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 13.44 |
| 1199 | | | | | | | | | | | | |
| 1200 | **Lognormal GOF Test** | | | | | | | | | | | |
| 1201 | Shapiro Wilk Test Statistic | | | | | 0.943 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 1202 | 5% Shapiro Wilk Critical Value | | | | | 0.94 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1203 | Lilliefors Test Statistic | | | | | 0.099 | **Lilliefors Lognormal GOF Test** | | | | | |
| 1204 | 5% Lilliefors Critical Value | | | | | 0.139 | Data appear Lognormal at 5% Significance Level | | | | | |
| 1205 | **Data appear Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 1206 | | | | | | | | | | | | |
| 1207 | **Lognormal Statistics** | | | | | | | | | | | |
| 1208 | Minimum of Logged Data | | | | | 1.504 | Mean of logged Data | | | | | 2.302 |
| 1209 | Maximum of Logged Data | | | | | 3.871 | SD of logged Data | | | | | 0.501 |
| 1210 | | | | | | | | | | | | |
| 1211 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 1212 | 95% H-UCL | | | | | 13.23 | 90% Chebyshev (MVUE) UCL | | | | | 14.11 |
| 1213 | 95% Chebyshev (MVUE) UCL | | | | | 15.38 | 97.5% Chebyshev (MVUE) UCL | | | | | 17.15 |
| 1214 | 99% Chebyshev (MVUE) UCL | | | | | 20.63 | | | | | | |
| 1215 | | | | | | | | | | | | |
| 1216 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 1217 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 1218 | | | | | | | | | | | | |
| 1219 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 1220 | 95% CLT UCL | | | | | 13.6 | 95% Jackknife UCL | | | | | 13.65 |
| 1221 | 95% Standard Bootstrap UCL | | | | | 13.58 | 95% Bootstrap-t UCL | | | | | 15.26 |
| 1222 | 95% Hall's Bootstrap UCL | | | | | 24.27 | 95% Percentile Bootstrap UCL | | | | | 13.7 |
| 1223 | 95% BCA Bootstrap UCL | | | | | 14.4 | | | | | | |
| 1224 | 90% Chebyshev(Mean, Sd) UCL | | | | | 15.3 | 95% Chebyshev(Mean, Sd) UCL | | | | | 17 |
| 1225 | 97.5% Chebyshev(Mean, Sd) UCL | | | | | 19.36 | 99% Chebyshev(Mean, Sd) UCL | | | | | 24 |
| 1226 | | | | | | | | | | | | |
| 1227 | **Suggested UCL to Use** | | | | | | | | | | | |
| 1228 | 95% Adjusted Gamma UCL | | | | | 13.44 | | | | | | |
| 1229 | | | | | | | | | | | | |
| 1230 | When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test | | | | | | | | | | | |
| 1231 | When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL | | | | | | | | | | | |
| 1232 | | | | | | | | | | | | |
| 1233 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 1234 | Recommendations are based upon data size, data distribution, and skewness. | | | | | | | | | | | |
| 1235 | These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). | | | | | | | | | | | |
| 1236 | However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 1237 | | | | | | | | | | | | |

# APPENDIX E
# CALCULATIONS FOR MUTAGENIC MODE OF ACTION CHEMICALS

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# Appendix E – Calculations for Mutagenic Mode of Action Chemicals

**Ingestion Risk Calculations for MMOA Chemicals**.

The equations used in the calculation of the Risk from exposure to Chemicals with a Mutagenic Mode of Action for ingestion, dermal and inhalation exposures are provided below for Chromium VI, and PAHs.

**General Equation**:

$$\text{Risk} = \frac{\text{EPC} \times \text{IR}_{(\text{age specific})} \times \text{CF} \times \text{EF} \times \text{ED}_{(\text{age specific})}}{\text{AT} \times \text{BW}_{(\text{age specific})}} \times \text{ADAF(age specific)} \times \text{SF}$$

The parameters used for each age range are provided below for oral ingestion.

| Input Parameter | Units | Age Range (0 to 2 yrs) | Age Range (2 to < 6 yrs) | Age Range (6 to<6 yrs) | Age Range 16 to 26yrs |
|---|---|---|---|---|---|
| Exposure Point Concentration (EPC) | mg/kg | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Ingestion Rate (IR) | mg/day | 200 | 200 | 100 | 100 |
| Conversion Factor (CF) | kg/mg | 1E-06 | 1E-06 | 1E-06 | 1E-06 |
| Bodyweight (BW) | kg | 15 | 15 | 80 | 80 |
| Exposure Frequency (EF) | days/year | 350 | 350 | 350 | 350 |
| Exposure Duration (ED) | years | 2 | 4 | 10 | 10 |
| Averaging Time (AT) | days | 25,550 | 25,550 | 25,550 | 25,550 |
| Oral Slope Factor (SF) | $(\text{mg/kg-day})^{-1}$ | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Age Dependent Adjustment Factor (ADAF_ | unitless | 10 | 3 | 3 | 1 |

The calculated cancer risks are summed across age range to provide a total cancer risk. Total cancer risk presented in Tables 7.1 to 7.2 represent the Sum of Risks for ages 0 to 2 yrs, 2 to < 6 yrs, 6 to < 16 yrs, and 16 to 26 yrs for the future resident exposed to soils at depths of 0 to 2 ft bgs and 0 ft bgs to the Water Table.

**Dermal Exposure Risk Calculations for MMOA Chemicals**.

The equation and parameters use for dermal exposure are provided below.

$$\text{Risk} = \frac{EPC \times EF \times ED \times SA_{(age\ specific)} \times AF_{(age\ specific)} \times ABSd}{AT \times BW_{(age\ specific)} \times 10^{6}} \times ADAF(age\ specific) \times SF$$

The parameters used for each age range are provided below for oral ingestion.

| Input Parameter | Units | Age Range (0 to 2 yrs) | Age Range (2 to < 6 yrs) | Age Range (6 to<6 yrs) | Age Range 16 to 26yrs |
|---|---|---|---|---|---|
| Exposure Point Concentration (EPC) | mg/kg | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Dermal Absorption Fraction (ABSd) | unitless | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Dermal Adherence Factor (AF)__ | $mg/cm^2$ | 0.2 | 0.2 | 0.07 | 0.07 |
| Skin Surface Area (SA) | $cm^2$/day | 2,373 | 2,373 | 6,032 | 6,032 |
| Conversion Factor kg to mg (CF) | mg/kg | 1E+06 | 1E+06 | 1E+06 | 1E+06 |
| Bodyweight (BW) | kgs | 15 | 15 | 80 | 80 |
| Exposure Frequency (EF) | days/year | 350 | 350 | 350 | 350 |
| Exposure Duration (ED) | years | 2 | 4 | 10 | 10 |
| Averaging Time (AT) | days | 25,550 | 25,550 | 25,550 | 25,550 |
| Oral Cancer Slope Factor (SF) | $(mg/kg\text{-}day)^{-1}$ | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Age Dependent Adjustment Factors (ADAFs) | unitless | 10 | 3 | 3 | 1 |

The calculated cancer risks are summed across age range to provide a total cancer risk. Total cancer risk presented in Tables 7.1 to 7.2 represent the Sum of Risks for ages 0 to 2 yrs, 2 to < 6 yrs, 6 to < 16 yrs, and 16 to 26 yrs for the future resident exposed to soils at depths of 0 to 2 ft bgs and 0 ft bgs to the Water Table.

**Inhalation Exposure Risk Calculations for MMOA Chemicals**.

The equation and parameters use for inhalation exposures are provided below.

The soil data is used to calculate an air concentration based on particulate emission factors and volatilization factor values. The result is a concentration in units of ug/$m^3$.

Using these concentrations, the exposures are calculated

$$\text{Risk} = \frac{\text{EPC} \times 1\ \text{day}/24\ \text{hours} \times \text{EF} \times \text{ED} \times \text{ET} \times \text{CF}}{\text{AT} \times \text{LT}} \times \text{ADAF}_{(\text{age specific})} \times \text{IUR}$$

| Input Parameter | Units | Age Range (0 to 2 yrs) | Age Range (2 to < 6 yrs) | Age Range (6 to<6 yrs) | Age Range 16 to 26yrs |
|---|---|---|---|---|---|
| Exposure Point Concentration (EPC) | ug/m3 | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Exposure Frequency (EF) | Days/year | 350 | 350 | 350 | 350 |
| Exposure Duration (ED) | years | 2 | 4 | 10 | 10 |
| Exposure Time (ET) | Hours/day | 24 | 24 | 24 | 24 |
| Exposure Frequency (EF) | days/year | 350 | 350 | 350 | 350 |
| Averaging Time (AT) | days | 365 | 365 | 365 | 365 |
| Lifetime (LT) | Years | 70 | 70 | 70 | 70 |
| Inhalation Unit Risk Factor (IUR) | $(ug/m^3)^{-1}$ | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Age Dependent Adjustment Factors (ADAFs) | unitless | 10 | 3 | 3 | 1 |

The calculated cancer risks are summed across age ranges to provide a total cancer risk. Total cancer risk presented in Tables 7.1 to 7.2 represent the Sum of Risks for ages 0 to 2 yrs, 2 to < 6 yrs, 6 to < 16 yrs, and 16 to 26 yrs for the future resident exposed to soils at depths of 0 to 2 ft bgs and 0 ft bgs to the Water Table.

The parameters used for each age range are provided below for oral ingestion.

| Input Parameter | Units | Age Range (0 to 2 yrs) | Age Range (2 to < 6 yrs) | Age Range (6 to<6 yrs) | Age Range 16 to 26yrs |
|---|---|---|---|---|---|
| Exposure Point Concentration (EPC) | mg/kg | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Dermal Absorption Fraction (ABSd) | unitless | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Dermal Adherence Factor (AF)__ | $mg/cm^2$ | 0.2 | 0.2 | 0.07 | 0.07 |
| Skin Surface Area (SA) | $cm^2$/day | 2,373 | 2,373 | 6,032 | 6,032 |
| Conversion Factor kg to mg (CF) | mg/kg | 1E+06 | 1E+06 | 1E+06 | 1E+06 |
| Bodyweight (BW) | kgs | 15 | 15 | 80 | 80 |
| Exposure Frequency (EF) | days/year | 350 | 350 | 350 | 350 |
| Exposure Duration (ED) | years | 2 | 4 | 10 | 10 |
| Averaging Time (AT) | days | 25,550 | 25,550 | 25,550 | 25,550 |
| Oral Cancer Slope Factor (SF) | $(mg/kg\text{-}day)^{-1}$ | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Age Dependent Adjustment Factors (ADAFs) | unitless | 10 | 3 | 3 | 1 |

The equation and parameters use for inhalation exposure are provided below.

$$\text{Risk} = \frac{EPC \times EF \times ED \times SA_{(age\ specific)} \times AF_{(age\ specific)} \times ABSd}{AT \times BW_{(age\ specific)} \times 10^{6}} \times ADAF(age\ specific) \times SF$$

The parameters used for each age range are provided below for oral ingestion.

| Input Parameter | Units | Age Range (0 to 2 yrs) | Age Range (2 to < 6 yrs) | Age Range (6 to<6 yrs) | Age Range 16 to 26yrs |
|---|---|---|---|---|---|
| Exposure Point Concentration (EPC) | mg/kg | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Dermal Absorption Fraction (ABSd) | unitless | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Dermal Adherence Factor (AF)__ | $mg/cm^2$ | 0.2 | 0.2 | 0.07 | 0.07 |
| Skin Surface Area (SA) | $cm^2/day$ | 2,373 | 2,373 | 6,032 | 6,032 |
| Conversion Factor kg to mg | mg/kg | 1E+06 | 1E+06 | 1E+06 | 1E+06 |
| Bodyweight | kgs | 15 | 15 | 80 | 80 |
| Exposure Frequency (EF) | days/year | 350 | 350 | 350 | 350 |
| Exposure Duration (ED) | years | 2 | 4 | 10 | 10 |
| Averaging Time (AT) | days | 25,550 | 25,550 | 25,550 | 25,550 |
| SF(oral) | $(mg/kg\text{-}day)^{-1}$ | Chemical Specific | Chemical Specific | Chemical Specific | Chemical Specific |
| Age Dependent Adjustment Factor | unitless | 10 | 3 | 3 | 1 |

The calculated cancer risks are summed across the age range to provide a total cancer risk presented in Tables 7.1 and 7.2.

# APPENDIX F
# ADDENDUM WITH CALCULATIONS OF CANCER RISKS AND NON-CANCER HAZARDS FOR THE CENTRAL TENDENCY EXPOSURE (E.G. AVERAGE)

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**Table 3.1 (CTE) Risk Assessment Guidance for Superfund Part D Tables**

**Exposure Point Concentration Summary for Future Resident Worker Exposures to Depths of 0 to 2 ft bgs.**

**Central Tendency Exposure**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York-**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil (0 to 2 ft bgs)

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) (1) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic (2) | Rationale* |
| Soil at depths of 0 to 2 ft bgs | Aluminum | mg/kg | 5,422 | 6,058 (N) | 8,600 | 6,058 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Aroclor 1260 | mg/kg | 0.08 | 0.261 (NP) | 0.66 | 0.261 | mg/kg | Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1) | Recommended UCL from ProUCL |
| | Arsenic (inorganic) | mg/kg | 3.09 | 3.573 (N) | 5.4 | 3.573 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Benzene | mg/kg | 0.003 | Maximum | 0.003 | 0.003 | mg/kg | Maximum Concentration | Maximum Concentration |
| | Benzo[a]anthracene | mg/kg | 1.34 | 13.1 (NP) | 19 (J) | 13.1 | mg/kg | 99% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Benzo[a]pyrene | mg/kg | 1.20 | 11.72 (NP) | 17 (J) | 11.72 | mg/kg | 99% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Benzo[b]fluoranthene | mg/kg | 1.63 | 15.86 (NP) | 23 (J) | 15.86 | mg/kg | 99% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Chromium (VI) | mg/kg | 7.25 | 8.261 (N) | 12 | 8.261 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Cobalt | mg/kg | 3.87 | 4.517 (G) | 6 | 4.517 | mg/kg | 95% Adjusted Gamma UCL | Recommended UCL from ProUCL |
| | Dibenz(a,h)anthracene | mg/kg | 0.21 | 1.377 (NP) | 3 (J) | 1.377 | mg/kg | 97.5% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Indeno[1,2,3-cd]pyrene | mg/kg | 0.59 | 3.854 (NP) | 8.4 (J) | 3.854 | mg/kg | 97.5% KM (Chebyshev) UCL | Recommended UCL from ProUCL |
| | Iron | mg/kg | 11,275 | 12,917 (G) | 17,000 | 12,917 | mg/kg | 95% Adjusted Gamma UCL | Recommended UCL from ProUCL |
| | Manganese | mg/kg | 359 | 437.1 (N) | 880 | 437.1 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Trichlorethylene | mg/kg | 0.0014 | Maximum | 0.0014 | 0.0014 | mg/kg | Maximum Concentration | Maximum Concentration |
| | Vanadium | mg/kg | 10 | 11.62 (N) | 15 | 11.62 | mg/kg | 95% Student's-t UCL | Recommended UCL from ProUCL |
| | Vinyl chloride | mg/kg | 0.0056 | Maximum | 0.0056 | 0.0056 | mg/kg | Maximum Concentration | Maximum Concentration |

Footnotes:

Average of duplicate samples was used to calculate the arithmetic mean, 95% UCL, and maximum concentrations.

J: Estimated value

(1) Define the codes describing the type of distribution for the "95% UCL" term.

G: Gamma

N: Normal

NP: Non parametric

**Table 4.1. (CTE) Risk Assessment Guidance for Superfund Part D Tables**

**Values Used for Daily Intake Calculations for Soil Ingestion Pathway for Depths (0 to 2 ft bgs)**

**Central Tendency Exposure Parameters for Ingestion**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil depths of 0 to 2 ft bgs

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion of soil | Resident (Two Depths - 0 to 2 ft bgs and 0 ft bgs to Water Table) | Child | Soils at depths from 0 to 2 ft bgs and from 0 ft bgs to water table | $Intake_{c\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{C-soil-ing} = \frac{EPC \times EF_c \times ED_c \times IRS_c \times RBA}{BW_c \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value from Appendix F Table 3.1 | mg/kg | Appendix F - Table 3.1 | |
| | | | | $EF_c$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_c$ | Exposure duration (Average Residence Rate) | 3 | year | USEPA, 2011 | |
| | | | | $IRS_c$ | Soil ingestion rate | 200 | mg/day | USEPA, 1991 | $Intake_{C-soil-ing} = \frac{EPC \times EF_c \times ED_c \times IRS_c \times RBA}{BW_c \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $BW_c$ | Body weight | 15 | kg | USEPA, 1991 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | USEPA, 1989 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 3 | year | Equal to Average ED | |
| | | | | RBA | Relative bioavailability | Chemical Specific | % | USEPA, 2012 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Adult | | $Intake_{a\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Value | mg/kg-day | Calculated | $Intake_{a-soil-ing} = \frac{EPC \times EF_a \times ED_a \times IRS_a \times RBA}{BW_a \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value from Appendix F Table 3.1 | mg/kg | Appendix F - Table 3.1 | |
| | | | | $EF_a$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_a$ | Exposure duration (Average Exposure Duration) | 6 | year | USEPA, 2011 | |
| | | | | $IRS_a$ | Soil ingestion rate | 100 | mg/day | USEPA, 1991 | $Intake_{a-soil-ing} = \frac{EPC \times EF_a \times ED_a \times IRS_a \times RBA}{BW_a \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $BW_a$ | Body weight | 80 | kg | USEPA, 1991 | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | USEPA, 1989 | |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 6 | year | Equal to ED | |
| | | | | RBA | Relative bioavailability | Chemical Specific | % | USEPA, 2012 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Age-adjusted for carcinogens | | $Intake_{aa\text{-}soil\text{-}ing}$ | Soil intake via ingestion | Calculated Chemical specific Value | mg/kg-day | Calculated | $Intake_{a-soil-ing} = \frac{EPC \times IRS_{aa} \times RBA}{AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value from Appendix F Table 3.1 | mg/kg | Appendix F - Table 3.1 | |
| | | | | $IRS_{aa}$ | Ingestion rate | 16,625 | mg-soil/ kg-body weight | Calculated | $IRS_{aa} = \frac{ED_c \times EF_c \times IRS_c}{BW_c} + \frac{ED_a \times EF_a \times IRS_a}{BW_a}$ |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | years | USEPA, 1989 | |
| | | | | RBA | Relative bioavailability | Chemical Specific | % | USEPA, 2012 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | | | Note parameters not defined here are available above. | | | | | |

Footnote Instructions:

NA: Not applicable

USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2011. Exposure Factors Handbook 2011 Edition (Final).

USEPA, 2012. OSWER Directive 9200.1-113, Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil.

Exposure Duration is based on a total of 9 years in a residence (Exposure Factors Handbook). The Exposue Duration was divided into 3 years for the young child and 6 years for the adult.

**Table 4.2 (CTE) Risk Assessment Guidance for Superfund Part D Tables**

**Values Used for Daily Intake Calculations for Dermal Contact with Soil Pathway for Chemicals - Fugure Resident (Depth 0 ft bgs to 2 ft bgs).**

**Central Tendency Exposure Parameters for Dermal Contact**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil from 0 bgs to 2 ft bgs

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal contact with soil | Resident (Two soil depths) | Child | Scenario 1: soil from 0 to 2 ft bgs and Scenario 2: soil from 0 ft bgs to Water Table | $Intake_{c\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{C-soil-dc} = \frac{EPC \times EF_c \times ED_c \times SA_c \times AF_c \times ABS_d}{BW_c \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value from Appendix F Table 3.1 | mg/kg | Appendix F - Table 3.1 | |
| | | | | $EF_c$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_c$ | Exposure duration | 3 | year | USEPA, 2011 | |
| | | | | $SA_c$ | Skin surface area for contact with soil | 2,373 | $cm^2$/day | USEPA, 2011 | |
| | | | | $AF_c$ | Soil to skin adherence factor | 0.2 | $mg/cm^2$ | USEPA, 2002 | |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | |
| | | | | $BW_c$ | Body weight | 15 | kg | USEPA, 1991 | $Intake_{c-soil-dc} = \frac{EPC \times EF_c \times ED_c \times SA_c \times AF_c \times ABS_d}{BW_c \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 3 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA, 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Adult | | $Intake_{a\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{a-soil-dc} = \frac{EPC \times EF_a \times ED_a \times SA_a \times AF_a \times ABS_d}{BW_a \times AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value from Appendix F Table 3.1 | mg/kg | Appendix F - Table 3.1 | |
| | | | | $EF_a$ | Exposure frequency | 350 | days/year | USEPA, 1991 | |
| | | | | $ED_a$ | Exposure duration | 6 | year | USEPA, 2011 | |
| | | | | $SA_a$ | Skin surface area for contact with soil | 6,032 | $cm^2$/day | USEPA, 2011 | |
| | | | | $AF_a$ | Soil to skin adherence factor | 0.07 | $mg/cm^2$ | USEPA, 2002 | |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | |
| | | | | $BW_a$ | Body weight | 80 | kg | USEPA, 1991 | $Intake_{a-soil-dc} = \frac{EPC \times EF_a \times ED_a \times SA_a \times AF_a \times ABS_d}{BW_a \times AT_{nc} \times 365 \times 10^6}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 6 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA, 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | Age-adjusted | | $Intake_{aa\text{-}soil\text{-}dc}$ | Soil intake via dermal contact | Calculated Chemical specific Values | mg/kg-day | Calculated | $Intake_{aa-soil-dc} = \frac{EPC \times DF_{aa} \times ABS_d}{AT_c \times 365 \times 10^6}$ |
| | | | | EPC | Exposure point concentration | Chemical specific Value from Appendix F Table 3.1 | mg/kg | Appendix F - Table 3.1 | |
| | | | | $DF_{aa}$ | Dermal factor | 44,306 | mg-soil/ kg-body weight | Calculated | |
| | | | | $ABS_d$ | Dermal absorption factor | Chemical specific | unitless | USEPA, 2004 | $DF_{aa} = \frac{ED_c \times EF_c \times SA_c \times AF_c}{BW_c} + \frac{ED_a \times EF_a \times SA_a \times AF_a}{BW_a}$ |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA, 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | |
| | | | | $10^6$ | Converts soil in kg to mg | $10^6$ | mg/kg | NA | |
| | | | | Note parameters not defined here are available above. | | | | | |

Footnote Instructions:


USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

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

USEPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP. July 2004

USEPA, 2011. Exposure Factors Handbook 2011 Edition (Final).


Exposure Duration is based on a total of 9 years in a residence (Exposure Factors Handbook). The Exposue Duration was divided into 3 years for the young child and 6 years for the adult.

**Table 4.3 (CTE) Risk Assessment Guidance for Superfund Part D Tables**

**Values Used for Vapor Inhalation Pathway Calculations for Non-Carcinogenic Chemicals - Exposures from 0 to 2 ft bga and 0 ft bgs to Water Table**

**Central Tendency Exposure Parameters - Air Expsoures**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Ambient air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation of vapors | Resident (Dpths 0 to 2 ft bgs and 0 ft bgs to Water Table) | Child | Breathing zone | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | mg/m$^3$ | Calculated | $EC = \frac{CA \times ET_{oc} \times ED_c \times EF_c}{AT_c \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | mg/m$^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | Appendix F - Table 3.1 | |
| | | | | $ET_{oc}$ | Exposure time | 24 | hours/day | USEPA, 2014 | |
| | | | | $ED_c$ | Exposure duration | 3 | year | USEPA, 2011 | |
| | | | | $EF_c$ | Exposure frequency | 350 | days/year | USEPA, 1991 | $EC = \frac{CA \times ET_{oc} \times ED_c \times EF_c}{AT_{nc} \times 365 \times 24}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 3 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging Time - carcinogens | 70 | years | USEPA, 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $CA = CS \times VF_{ss}$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for air emissions | Chemical specific | kg-soil/m$^3$-air | Calculated | |
| | | Adult | | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | mg/m$^3$ | Calculated | $EC = \frac{CA \times ET_{oa} \times ED_a \times EF_a}{AT_c \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | mg/m$^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | Appendix F - Table 3.1 | |
| | | | | $ET_{oa}$ | Outdoor exposure time | 24 | hours/day | USEPA, 2014 | |
| | | | | $ED_a$ | Exposure duration | 6 | year | USEPA, 2011 | |
| | | | | $EF_a$ | Exposure frequency | 350 | days/year | USEPA, 1991 | $EC = \frac{CA \times ET_{oa} \times ED_a \times EF_a}{AT_{nc} \times 365 \times 24}$ |
| | | | | $AT_{nc}$ | Averaging time (non-carcinogens) | 6 | year | Equal to ED | |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA, 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $CA = CS \times VF_{ss}$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for air emissions | Chemical specific | kg-soil/m$^3$-air | Calculated | |
| | | Age-adjusted | | EC | Exposure concentration | Calculated Chemical specific Concentration in Air | mg/m$^3$ | Calculated | $EC = \frac{CA \times ET_{oaa} \times ED_{aa} \times EF_{aa}}{AT_c \times 365 \times 24}$ |
| | | | | CA | Ambient air exposure point concentration | Calculated Chemical specific Concentration in Air | mg/m$^3$ | Calculated | |
| | | | | CS | Soil exposure point concentration | Chemical specific | mg/kg | Appendix F - Table 3.1 | |
| | | | | $ET_{oaa}$ | Exposure time | 24 | hours/day | USEPA, 2014 | |
| | | | | $ED_{aa}$ | Exposure duration | 9 | year | USEPA, 2011 | |
| | | | | $EF_{aa}$ | Exposure frequency | 350 | days/year | USEPA, 1991 | $CA = CS \times VF_{ss}$ |
| | | | | $AT_c$ | Averaging time (carcinogens) | 70 | year | USEPA, 1989 | |
| | | | | 365 | Converts $AT_{nc}$ in years to days | 365 | days/year | NA | $ED_{aa} = ED_c + ED_a$ |
| | | | | 24 | Converts day to hours | 24 | hours/day | NA | |
| | | | | $VF_{ss}$ | Volatilization factor for surface soils | Chemical specific | kg-soil/m$^3$-air | Calculated | |
| | | | | Note parameters not defined here are available above. | | | | | |

Footnote Instructions:


USEPA, 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2011. Exposure Factors Handbook 2011 Edition (Final).

USEPA, 2014. OSWER Directive 9200.1-120, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors


Exposure Duration is based on a total of 9 years in a residence (Exposure Factors Handbook). The Exposue Duration was divided into 3 years for the young child and 6 years for the adult.

**Table 7.1 (CTE) Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Central Tendency Exposure (CTE) - Future Resident**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 bgs to 2 Feet bgs)
Receptor Age: Adult/Child (cancer) and Non-cancer- Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Soil | Soil from 0 ft bgs to 2 ft bgs | Ingestion | Aluminum | 6,058 | mg/kg | 0.00726 | mg/kg-day | - | | - | 0.0775 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | 0.08 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.0000003 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 6.26E-07 | 0.00000334 | mg/kg-day | 0.00002 | $(mg/kg\text{-}day)^{-1}$ | **0.2** |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 2.57E-06 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | **3.85E-06** | 0.0000274 | mg/kg-day | 0.0003 | $(mg/kg\text{-}day)^{-1}$ | 0.09 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 0.00008 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **8.06E-06** | 0.000167 | mg/kg-day | - | | - |
| | | | | Benzene | 0.003 | mg/kg | 3.600E-09 | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | 1.98E-10 | 3.84E-08 | mg/kg-day | 0.004 | $(mg/kg\text{-}day)^{-1}$ | 0.00001 |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.00007 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **7.21E-05** | 0.00015 | mg/kg-day | 0.0003 | $(mg/kg\text{-}day)^{-1}$ | **0.5** |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.0001 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **9.76E-06** | 0.000203 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.00005 | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | **2.54E-05** | 0.000106 | mg/kg-day | 0.003 | $(mg/kg\text{-}day)^{-1}$ | 0.04 |
| | | | | Cobalt | 4.517 | mg/kg | 0.00001 | mg/kg-day | - | | - | 0.0000578 | mg/kg-day | 0.0003 | $(mg/kg\text{-}day)^{-1}$ | **0.2** |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.00001 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **8.47E-06** | 0.0000176 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.00002 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **2.37E-06** | 0.0000493 | mg/kg-day | - | | - |
| | | | | Iron | 12,917 | mg/kg | 0.02 | mg/kg-day | - | | - | 0.165 | mg/kg-day | 0.7 | $(mg/kg\text{-}day)^{-1}$ | **0.2** |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.0005 | mg/kg-day | - | | - | 0.00559 | mg/kg-day | 0.02 | $(mg/kg\text{-}day)^{-1}$ | **0.2** |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.000000003 | mg/kg-day | 0.046 | $(mg/kg\text{-}day)^{-1}$ | 1.42E-10 | 1.79E-08 | mg/kg-day | 0.0005 | $(mg/kg\text{-}day)^{-1}$ | 0.00004 |
| | | | | Vanadium | 11.62 | mg/kg | 0.00001 | mg/kg-day | - | | - | 0.000149 | mg/kg-day | 0.005 | $(mg/kg\text{-}day)^{-1}$ | 0.03 |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.0000001 | mg/kg-day | 0.72 | $(mg/kg\text{-}day)^{-1}$ | 5.86E-08 | 7.16E-08 | mg/kg-day | 0.003 | $(mg/kg\text{-}day)^{-1}$ | 0.00002 |
| | | | Exp. Route Total | | | | | | | | 1.3E-04 | | | | | 1.56 |
| Soil | Soil | Soil from 0 ftbgs to 2 ftbgs | Dermal | Aluminum | 6,058 | mg/kg | - | mg/kg-day | - | | - | - | | 1 | mg/kg-day | - |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.0000001 | mg/kg-day | 2 | $(mg/kg\text{-}day)^{-1}$ | 2.22E-07 | 0.00000111 | mg/kg-day | 0.00002 | mg/kg-day | 0.06 |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.0000003 | mg/kg-day | 1.5 | $(mg/kg\text{-}day)^{-1}$ | 4.88E-07 | 0.00000325 | mg/kg-day | 0.0003 | mg/kg-day | 0.01 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 0.00003 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **2.58E-06** | 0.0000517 | mg/kg-day | - | | - |
| | | | | Benzene | 0.003 | mg/kg | - | mg/kg-day | 0.055 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.004 | mg/kg-day | - |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.00002 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **2.31E-05** | 0.0000462 | mg/kg-day | 0.0003 | mg/kg-day | **0.2** |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.00003 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | **3.13E-06** | 0.0000626 | mg/kg-day | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | - | mg/kg-day | 0.5 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.003 | mg/kg-day | - |
| | | | | Cobalt | 4.517 | mg/kg | - | mg/kg-day | - | | - | - | | 0.0003 | mg/kg-day | - |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.000003 | mg/kg-day | 1 | $(mg/kg\text{-}day)^{-1}$ | **2.72E-06** | 0.00000543 | mg/kg-day | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.00001 | mg/kg-day | 0.1 | $(mg/kg\text{-}day)^{-1}$ | 7.60E-07 | 0.0000152 | mg/kg-day | - | | - |
| | | | | Iron | 12,917 | mg/kg | - | mg/kg-day | - | | - | - | | 0.7 | mg/kg-day | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | - | mg/kg-day | - | | - | - | | 0.02 | mg/kg-day | - |
| | | | | Trichloroethylene | 0.0014 | mg/kg | - | mg/kg-day | 0.05 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.0005 | mg/kg-day | - |
| | | | | Vanadium | 11.62 | mg/kg | - | mg/kg-day | - | | - | - | | 0.00504 | mg/kg-day | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | - | | 0.7 | $(mg/kg\text{-}day)^{-1}$ | - | - | | 0.003 | mg/kg-day | - |
| | | | Exp. Route Total | | | | | | | | 3.3E-05 | | | | | 0.2 |

**Table 7.1 (CTE) Risk Assessment Guidance for Superfund Part D Tables**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Central Tendency Exposure (CTE) - Future Resident**

**Site SS-017, Former Griffiss Air Force Base, Rome, New York**

Scenario Timeframe: Future
Receptor Population: Resident (Soil from 0 bgs to 2 Feet bgs)
Receptor Age: Adult/Child (cancer) and Non-cancer- Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations - Child/Adult | | | | | Non-Cancer Hazard Calculations - Child | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Soil | Ambient air vapors and particulates | Breathing zone | Inhalation | Aluminum | 6,058 | mg/kg | 0.0007 | µg/m$^3$ | - | | - | 0.00000427 | mg/m$^3$ | 0.005 | mg/m$^3$ | 0.0009 |
| | | | | Aroclor 1260 | 0.261 | mg/kg | 0.00005 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 2.91E-08 | 0.000000297 | mg/m$^3$ | - | | - |
| | | | | Arsenic, Inorganic | 3.573 | mg/kg | 0.0000004 | µg/m$^3$ | 0.004 | (µg/m$^3$)$^{-1}$ | 1.86E-09 | 2.52E-09 | mg/m$^3$ | 0.000015 | mg/m$^3$ | 0.0002 |
| | | | | Benz[a]anthracene | 13.1 | mg/kg | 0.002 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 1.22E-07 | 0.00000286 | mg/m$^3$ | - | | - |
| | | | | Benzene | 0.003 | mg/kg | 0.0001 | µg/m$^3$ | 0.000008 | (µg/m$^3$)$^{-1}$ | 1.09E-09 | 0.000000814 | mg/m$^3$ | 0.03 | mg/m$^3$ | 0.00003 |
| | | | | Benzo[a]pyrene | 11.72 | mg/kg | 0.00001 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 3.54E-09 | 8.27E-09 | mg/m$^3$ | 0.000002 | mg/m$^3$ | 0.004 |
| | | | | Benzo[b]fluoranthene | 15.86 | mg/kg | 0.00001 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 4.79E-10 | 1.12E-08 | mg/m$^3$ | - | | - |
| | | | | Chromium(VI) | 8.261 | mg/kg | 0.000004 | µg/m$^3$ | 0.08 | (µg/m$^3$)$^{-1}$ | 3.50E-07 | 5.83E-09 | mg/m$^3$ | 0.0001 | mg/m$^3$ | 0.00006 |
| | | | | Cobalt | 4.517 | mg/kg | 0.0000005 | µg/m$^3$ | 0.009 | (µg/m$^3$)$^{-1}$ | 4.92E-09 | 3.19E-09 | mg/m$^3$ | 0.000006 | mg/m$^3$ | 0.0005 |
| | | | | Dibenz[a,h]anthracene | 1.377 | mg/kg | 0.0000007 | µg/m$^3$ | 0.0006 | (µg/m$^3$)$^{-1}$ | 4.16E-10 | 9.71E-10 | mg/m$^3$ | - | | - |
| | | | | Indeno[1,2,3-cd]pyrene | 3.854 | mg/kg | 0.000002 | µg/m$^3$ | 0.00006 | (µg/m$^3$)$^{-1}$ | 1.17E-10 | 2.72E-09 | mg/m$^3$ | - | | - |
| | | | | Iron | 12,917 | mg/kg | 0.002 | µg/m$^3$ | - | | - | 0.00000911 | mg/m$^3$ | - | | - |
| | | | | Manganese (Non-diet) | 437.1 | mg/kg | 0.00005 | µg/m$^3$ | - | | - | 0.000000308 | mg/m$^3$ | 0.00005 | mg/m$^3$ | 0.006 |
| | | | | Trichloroethylene | 0.0014 | mg/kg | 0.0002 | µg/m$^3$ | 0.000004 | (µg/m$^3$)$^{-1}$ | 7.57E-10 | 0.000000608 | mg/m$^3$ | 0.002 | mg/m$^3$ | 0.0003 |
| | | | | Vanadium | 11.62 | mg/kg | 0.000001 | µg/m$^3$ | - | | - | 8.2E-09 | mg/m$^3$ | - | | - |
| | | | | Vinyl Chloride | 0.0056 | mg/kg | 0.007 | µg/m$^3$ | 0.000004 | (ug/m$^3$)$^{-1}$ | 3.00E-08 | 0.00000562 | mg/m$^3$ | 0.1 | mg/m$^3$ | 0.00006 |
| | | | Exp. Route Total | | | | | | | | 5.44E-07 | | | | | 0.01 |
| | | Exposure Point Total | | | | | | | | | 1.6E-04 | | | | | 1.8 |
| | Exposure Medium Total | | | | | | | | | | 1.6E-04 | | | | | 1.8 |
| Medium Total | | | | | | | | | | | 1.6E-04 | | | | | 1.8 |
| | | | | | | | | | Total of Receptor Risks Across All Media | | 1.6E-04 | Total of Receptor Hazards Across All Media | | | | 1.8 |

**TABLE 9.1. (CTE) Risk Assessment Guidance for Superfund Part D**

**Summary of Receptor Risks and Hazard Quotients for COPCs for Soil Concentrations from 0 bgs to 2 Feet bgs (Adult/Child Resident -Cancer and Child - Non-cancer)**

**Central Tendency Exposure (CTE) - Future Resident**

**Site SS017, Former Griffiss Air Force Base, Rome, New York**

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

| | | | | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient (Child) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil (0 to 2 feet) | Surface Soiil | SS-017 | Aluminum | - | - | - | | | Nervous system and morphological developmental | 0.08 | | - | 0.08 |
| | | | | | | | | | Brain (psychomotor and cognitive impairment effects) | | 0.0009 | | 0.0009 |
| | | | Aroclor 1260 | 6.26E-07 | 2.91E-08 | 0.000000222 | | 8.8E-07 | Ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails; decreased antibody (IgG and IgM) response to sheep erythrocytes. Based on oral RfD for Aroclor 1254. | **0.2** | | 0.06 | 0.2 |
| | | | | | | | | | NA | | - | | - |
| | | | Arsenic, Inorganic | **3.85E-06** | 1.86E-09 | 4.88E-07 | | 4.3E-06 | Hyperpigmentation, keratosis and possible vascular complications | 0.09 | | 0.01 | 0.1 |
| | | | | | | | | | Reproductive/ development; cardiovascular system; nervous system; lung; skin | | 0.0002 | | 0.0002 |
| | | | Benz[a]anthracene | **8.06E-06** | 1.22E-07 | **2.58E-06** | | 1.1E-05 | NA | - | | - | - |
| | | | | | | | | | NA | | - | | - |
| | | | Benzene | 1.98E-10 | 1.09E-09 | - | | 1.3E-09 | NA | 0.00001 | | - | - |
| | | | | | | | | | NA | | 0.00003 | | - |
| | | | Benzo[a]pyrene | **7.21E-05** | 3.54E-09 | **2.31E-05** | | 9.5E-05 | Developmental toxicity (Nervous system) | **0.5** | | **0.2** | 0.7 |
| | | | | | | | | | Developmental toxicity (Reproductive system) | | 0.004 | | 0.004 |
| | | | Benzo[b]fluoranthene | **9.76E-06** | 4.79E-10 | **3.13E-06** | | 1.3E-05 | NA | - | | - | NA |
| | | | | | | | | | NA | | - | | NA |
| | | | Chromium(VI) | **2.54E-05** | 3.50E-07 | - | | 2.6E-05 | Gastrointestinal tract | 0.04 | | - | 0.04 |
| | | | | | | | | | Respiratory system | | 0.00006 | | 0.00006 |
| | | | Cobalt | - | 4.92E-09 | - | | 4.9E-09 | Thyroid | **0.2** | | - | 0.2 |
| | | | | | | | | | Respiratory tract and lung | | 0.0005 | | 0.0005 |
| | | | Dibenz[a,h]anthracene | **8.47E-06** | 4.16E-10 | **2.72E-06** | | 1.1E-05 | NA | - | | - | NA |
| | | | | | | | | | NA | | - | | NA |
| | | | Indeno[1,2,3-cd]pyrene | **2.37E-06** | 1.17E-10 | 7.60E-07 | | 3.1E-06 | NA | - | | - | NA |
| | | | | | | | | | NA | | - | | NA |
| | | | Iron | - | - | - | | - | Gastrointestinal tract | **0.2** | | - | 0.2 |
| | | | | | | | | | NA | | - | | NA |
| | | | Manganese (Non-diet) | - | - | - | | - | Nervous system | **0.2** | | - | 0.2 |
| | | | | | | | | | Impairment of neurobehavioral function | | 0.006 | | 0.006 |
| | | | Trichloroethylene | 1.42E-10 | 7.57E-10 | - | | 9.0E-10 | Cardiac malformations in fetus | 0.00004 | | - | 0.00004 |
| | | | | | | | | | Decreased thymus weight in B6C3F1 mice | | 0.0003 | | 0.0003 |
| | | | Vanadium | - | - | - | | | Nervous system | 0.03 | | - | 0.03 |
| | | | | | | | | - | NA | | - | | NA |
| | | | Vinyl Chloride | 5.86E-08 | 3.00E-08 | - | | 8.9E-08 | Liver cell polymorphism | 0.00002 | | - | 0.00002 |
| | | | | | | | | | Liver cell polymorphism | | 0.00006 | | 0.00006 |
| | | Exposure Point Total | | | | | | 1.6E-04 | | | | | 1.8 |
| | Exposure Medium Total | | | | | | | 1.6E-04 | | | | | 1.8 |
| Medium Total | | | | | | | | 1.6E-04 | | | | | 1.8 |
| Receptor Total | | | | | | | Receptor Risk Total | 1.6E-04 | | | | Receptor HI Total | 1.8 |

| | |
|---|---|
| Total Developmental HI Across All Media = | 0.66 |
| Total Neurological System HI Across All Media = | 0.35 |
| Total Gastrointestinal HI Across All Media = | 0.27 |
| Total Immune HI Across All Media = | 0.22 |
| Total Thyroid HI Across All Media = | 0.19 |
| Total Skin and Blood HI Across All Media = | 0.10 |
| Total Respiratory Hi Across All Media = | 0.001 |
| Total Thymus HI Across Media = | 0.0003 |
| Total Reproductive HI Across All Media = | 0.0002 |
| Total Liver HI Across Media = | 0.0001 |
| Total Cardiac Hi Across All Media = | 0.00004 |