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Kansas City District

**Final Human Health
Risk Assessment**

Unimatic Manufacturing Corporation
Superfund Site
Fairfield, New Jersey

July 18, 2016



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Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
Cal/EPA	California Environmental Protection Agency
CDM Smith	CDM Federal Programs Corporation
COPC	chemicals of potential concern
CSM	conceptual site model
CTE	central tendency exposure
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
FS	Feasibility Study
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
JCMUA	Jersey City Municipal Utilities Authority
NJDEP	New Jersey Department of Environmental Protection
NOAEL	no-observed-adverse-effect level
OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PPRTV	Provisional Peer Reviewed Toxicity Values
QA	quality assurance
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
RPF	relative potency factor
RSL	Regional Screening Level
SF	slope factor
SVOC	semi-volatile organic compound
the Site	the Unimatic Manufacturing Corporation Superfund Site
UCL	upper confidence limit
Unimatic	Unimatic Manufacturing Corporation
VISL	vapor intrusion screening level
VOC	volatile organic compound
kg	kilogram
m ³	cubic meter
mg	milligram
µg	microgram

Executive Summary

Under the United States Army Corps of Engineers, Kansas City District, Contract No. W912DQ-11D-3004, Task Order No. 023, CDM Federal Programs Corporation (CDM Smith) has been directed to perform a remedial investigation/feasibility study (RI/FS) on behalf of the United States Environmental Protection Agency (EPA) Region 2 at the Unimatic Manufacturing Corporation (Unimatic) Superfund Site (the Site), located in Fairfield, New Jersey.

The overall purpose of the work assignment is to delineate soil contamination for RI/FS at the Site. Groundwater and surface water/sediment (Deepavaal Brook) will be addressed as part of a separate operable unit. This human health risk assessment (HHRA), as part of the RI/FS, is developed to characterize potential human health risks associated with the Site in the absence of any remedial action. The HHRA is conducted in accordance with RI Work Plan and current EPA guidance outlined in *Risk Assessment Guidance for Superfund*, Parts A, D, E, and F and other EPA guidance pertinent to human health risk assessments. The HHRA consists of sections describing Site background and setting, data evaluation, exposure assessment, toxicity assessment, and risk characterization, concluding with a summary of the risk assessment.

Site Location and Description

Four properties form the Site including the Unimatic property, located at 25 Sherwood Lane, Fairfield, New Jersey and three adjacent properties: 30 Sherwood Lane to the east, 21 Sherwood Lane to the west, and a public water service delivery pipeline property for the Jersey City Municipal Utilities Authority (JCMUA) to the north. The Site is in a primarily industrial area with residential subdivisions located nearby to the northeast. The Unimatic property is approximately 1.23 acres and contains a centrally located, 22,000-square-foot building on a partially paved parking lot.

The original Unimatic building was constructed in 1955 and operated an aluminum die casting manufacturing process from 1955 until 2001. Lubricants used as part of the manufacturing processes contained polychlorinated biphenyls (PCBs) within naphtha or mineral spirits. The spraying of the lubricant resulted in the spillage of the lubricant on to the floor and walls. Unimatic washed the PCB oils from the floor and walls into floor trenches, which subsequently conveyed the PCB-contaminated wastewater to pipes that discharged outside the building. The wastewater pipes consisted of both cast concrete and corrugated steel that leaked contaminated wastewater into underlying soil and groundwater prior to the discharge point at the northeast corner of the Unimatic property. PCB use at the Site ended in 1979 when it was banned nationwide.

Data Evaluation

Field investigations were conducted to characterize the nature and extent of contamination and identify possible sources of contamination at the Site. Soil samples were collected and analyzed as part of the investigations. Data usability assessments of all analytical data were performed and determined that all data met project requirements for representativeness, completeness, precision, and accuracy, and all data are suitable for use in this HHRA. Chemicals of potential

concern (COPCs) are identified based on criteria outlined in EPA risk assessment guidance, primarily through comparison to risk-based screening levels.

Exposure Assessment

Potential exposure pathways at the Site are defined based on potential source areas, release mechanisms, and current and potential future uses of the Site. Potential current and future receptors evaluated in the risk assessment include:

- Workers
- Trespassers
- Construction/Utility Workers

Exposure pathways evaluated for soil include ingestion of and dermal contact with soil and inhalation of particulates from soil by workers, trespassers, and construction/utility workers. In addition, exposure pathways evaluated for workers include inhalation of vapor through vapor intrusion.

Exposure point concentrations (EPCs) for the COPCs are used in the exposure assessment calculations to estimate potential chemical intake. The EPC is the lower of the upper confidence limit (UCL) of the mean or the maximum detected concentration.

Quantification of exposure includes evaluation of exposure parameters that describe the exposed population (e.g., contact rate, exposure frequency and duration, and body weight). Each exposure parameter in the equation has a range of values. Daily intakes are calculated based on the reasonable maximum exposure (RME) scenario (the highest exposure reasonably expected to occur at a site). The intent is to estimate a conservative exposure case that is still within the range of possible exposures. Central tendency exposure (CTE) assumptions are also developed when the estimated risks under RME scenario exceed EPA's threshold risk range. CTE scenarios reflect more typical exposures.

Toxicity Assessment

COPCs are quantitatively evaluated on the basis of their noncancer and/or cancer potential. The reference dose (RfD) and reference concentration (RfC) are the toxicity values used to evaluate noncancer health hazards in humans. Inhalation unit risk and slope factor are the toxicity values used to evaluate cancer health effects in humans. These toxicity values are obtained from various sources following the hierarchy order specified by EPA.

Risk Characterization

Risk characterization integrates the exposure and toxicity assessments into quantitative expressions of risks/health effects. To characterize potential noncancer health effects, comparisons are made between estimated intakes of substances and toxicity thresholds. Potential cancer effects are evaluated by calculating probabilities that an individual will develop cancer over a lifetime exposure based on projected intakes and chemical specific dose-response information. In general, EPA recommends target risk values, i.e., cancer risk of 1×10^{-6} (1 in 1 million) to 1×10^{-4} (1 in 10,000) or noncancer health hazard index (HI) of unity, as threshold

values for potential human health impacts (EPA 1989). These target values aid in determining whether additional remedial action is necessary at the Site. Risks for all receptors are estimated using RME assumptions. Risks are also estimated using CTE assumptions when the RME assumptions resulted in risk estimates above EPA's thresholds.

For the current and future land-use scenario, the estimated cancer risks for trespassers and construction/utility workers are within EPA's target range of 1×10^{-6} to 1×10^{-4} under the RME scenario. Risks for current and future workers are greater than EPA's target cancer risk range due to Aroclor 1248 but at the upper end of EPA's target cancer risk range for the CTE scenario. The total HIs for all current and future receptors under both RME and CTE scenarios are above EPA's threshold of unity (1). The noncancer HIs for eyes, fingers, toe nails, and immune system exceed EPA's threshold of unity due to exposure to Aroclor 1248.

Lead was evaluated separately and does not appear to be a concern for all receptors evaluated under both current and future land-use scenarios. Results of indoor air screening indicated that current and future workers could be exposed specifically to concentrations of Aroclor 1242 via inhalation of vapor emanating into enclosed structures via vapor intrusion and into ambient air via vaporization.

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Section 1

Introduction

Under the United States Army Corps of Engineers, Kansas City District, Contract No. W912DQ-11D-3004, Task Order No. 023, CDM Federal Programs Corporation (CDM Smith) has been directed to perform a remedial investigation/feasibility study (RI/FS) on behalf of the United States Environmental Protection Agency (EPA) Region 2 at the Unimatic Manufacturing Corporation Superfund Site (the Site), located in Fairfield, New Jersey.

The overall purpose of the work assignment is to delineate soil contamination for RI/FS at the Site. Groundwater and surface water/sediment (Deepavaal Brook) will be addressed as part of a separate operable unit. This human health risk assessment (HHRA), as part of the RI/FS, is developed to characterize potential human health risks associated with the Site in the absence of any remedial action.

This HHRA identifies the potential exposure pathways by which populations may be exposed. Exposure pathways are identified based on considerations of the sources and locations of contaminants related to the Site, the likely environmental fate of the contaminants, and the location and activities of the potentially exposed populations. The HHRA describes exposure points and routes of exposure for each exposure pathway as well as underlying assumptions regarding receptor characteristics and behavior (e.g., body weight, ingestion rate, and exposure frequency). The HHRA also identifies chemicals of potential concern (COPCs) for each environmental medium, exposure point concentrations (EPCs), and toxicity values of COPCs. Finally, the HHRA characterizes potential cancer risks and noncancer health hazards associated with each complete exposure pathway.

1.1 Overview

This HHRA is developed in accordance with RI Work Plan (CDM Smith 2015) and EPA guidance documents. In addition, CDM Smith reviewed the available information pertaining to the Site to prepare this HHRA. Potential exposure pathways, exposure routes, and potentially exposed populations under current and future land-use scenarios are identified. Exposure parameters and daily intakes for exposure scenarios are quantified, and toxicity values for COPCs are presented. The exposure pathways and receptors, exposure parameters, daily intakes, and toxicity values are presented in tabular form in accordance with the standard tables in *Risk Assessment Guidance for Superfund (RAGS) Part D* (EPA 2001) and the Office of Solid Waste and Emergency Response (OSWER) Directive 9200.1-120 (EPA 2014).

1.2 Report Organization

This HHRA is composed of eight sections, with tables and figures presented at the end of the text. The organization of the report and the contents of each section are described below.

Section 1 Introduction – provides an overview of the objectives and organization of the HHRA.

- Section 2 Site Background and Setting – briefly describes the Site location, Site history, Site geology and hydrogeology, demography, and land use.
- Section 3 Data Evaluation – presents sample collection and analysis of various media, analytical data summary, data usability, and identification of COPCs.
- Section 4 Exposure Assessment – presents the conceptual site model (CSM) and identifies potential exposure pathways and potential receptor populations under both current and future land-use scenarios. In addition, methods for calculating EPCs and exposure parameter assumptions are also presented.
- Section 5 Toxicity Assessment – discusses the relevant toxicity information of identified COPCs.
- Section 6 Risk Characterization – integrates the toxicity and exposure assessments into quantitative and qualitative expressions of risk and discusses uncertainties associated with the risk estimates.
- Section 7 Summary and Conclusions – summarizes the results of the risk assessment and presents conclusions based on the results.
- Section 8 References – provides a list of references cited.

Section 2

Site Background and Setting

This section discusses the Site location and description, Site history, geology and hydrogeology, demography, and land use. This information is used to develop site-specific information on exposure pathways and receptors associated with the Site.

2.1 Site Location and Description

The Unimatic facility is located at 25 Sherwood Lane, Fairfield, New Jersey (the Unimatic property). In addition to the Unimatic property, the Site also encompasses three adjacent properties: 30 Sherwood Lane to the east, 21 Sherwood Lane to the west, and a public water service delivery pipeline property for the Jersey City Municipal Utilities Authority (JCMUA) water system to the north. These four properties together form the Site. The Site is in a primarily industrial area, with residential subdivisions located approximately 800 feet to the northeast. The Unimatic property is approximately 1.23 acres and contains a centrally located 22,000-square foot building on a partially paved parking lot. Figure 2-1 shows the property boundaries and the neighboring properties.

2.2 Site History

The Unimatic operated an aluminum die-casting manufacturing process from 1955 until 2001. The original building was constructed at the center of property in 1955 and was expanded twice by 1970. This expansion coincided with an increase in production from the mid-1960s to the mid-1970s. The lubricating oil used in the die-casting process contained polychlorinated biphenyls (PCBs) within naphtha or mineral spirits. The lubricating oil was sprayed throughout the shop area and covered the floor and walls to a height of approximately 8 feet. Unimatic washed the PCB oils from the floor and walls into floor trenches, which subsequently conveyed the PCB-contaminated wastewater to pipes that discharged outside the building. The wastewater pipes consisted of both cast concrete and corrugated steel that leaked contaminated wastewater into underlying soil and groundwater prior to the discharge point at the northeast corner of the Unimatic property. PCB use at the Site ended in 1979 when it was banned nationwide.

EPA and New Jersey Department of Environmental Protection (NJDEP) issued numerous non-compliance and violation notices to Unimatic beginning in 1982; however, Unimatic continued to discharge large volumes of contaminated water through more than 200 feet of leaking wastewater pipes until 1988. In 1988, Unimatic installed a recirculating cooling system that reportedly eliminated discharges to the environment. Unimatic ceased all operations in 2001 and sold the property to Cardean, LLC which leased the building to Frameware, Inc. in 2002.

Numerous investigations and removal actions have been conducted at the Site since 2001. Tanks and 4,800 tons of contaminated soil were excavated and removed. However, high levels of PCB contamination in soil and groundwater remained throughout the Unimatic property and beyond the property boundaries. In response to a May 9, 2012 request from NJDEP, EPA initiated a removal site evaluation to determine if a removal action was warranted. Results from EPA

samples collected from the interior of the building and from surface soil outside of the building in September and October of 2012 indicated a release of PCBs to the environment, and that, at a minimum, surficial PCB Contamination was still present at the Site. Based on the results, EPA concluded that the Site did not meet the statutory requirements for taking an emergency removal action at the Site.

Based on the results of EPA's 2012 sampling, the New Jersey Department of Health, in consultation with the federal Agency for Toxic Substances and Disease Registry (ATSDR), issued a letter to NJDEP categorizing the current and future use of the Site as a public health hazard and recommended the relocation of workers. In response, Framework, Inc. moved its operations and workers, and decontaminated equipment and materials were removed from the Site. In April 2015, NJDEP installed a chain link fence to secure the Unimatic property, and in June 2015, the current RI was initiated. The Site was added to the National Priorities List on May 8, 2014. A detailed description of Site history can be found in the RI report (CDM Smith 2016).

2.3 Site Geology and Hydrogeology

This section provides a brief summary of the lithologic and hydrogeologic characteristics of the Site and immediate area. A more detailed description of Site geology and hydrogeology can be found in the RI report (CDM Smith 2016).

This Site is located within the Piedmont Physiographic Province, which is underlain by Triassic and Jurassic aged slightly folded and faulted clastic sedimentary rocks and Jurassic aged basalt. The Site lies in the Passaic River floodplain of northern New Jersey just west of the highlands of the Watchung Mountains. Area soils were deposited as glacial deltaic fans consisting of silty sands and gravels. Clays deposited as glacial lake-bottom sediments are also present.

Fairfield Township is located at the extreme northern edge of the Buried Valley Aquifer System recharge zone. The recharge zone of this aquifer system underlies the central basin of the Passaic River. This aquifer system is designated as a sole-source aquifer, meaning it is a sole or principal source of drinking water in the area. However, presently it is no longer being used as a source of drinking water in the area. Groundwater in the area generally flows in a north-northeast direction toward the Passaic River. The human health risks associated with groundwater will be evaluated following the conclusion of the groundwater investigation.

2.4 Demography and Land Use

The Site is located in Fairfield Township, Essex County, New Jersey, which encompasses 10.3 square miles. The area in the vicinity of the Site is primarily light industrial, commercial, and residential. According to the U.S. Census Bureau, the population of Fairfield Township in 2014 was 7,551 people (U.S. Census Bureau 2014).

Section 3

Data Evaluation

Samples of environmental media were collected in order to characterize the nature and extent of contamination at the Site. The data evaluation step consists of reviewing and evaluating available data, which allows for the identification of COPCs. The following subsections describe sample collection and analysis, data usability and the suitability of data for risk assessment purposes, analytical data summary, and the approach used to identify COPCs.

3.1 Sample Collection and Analysis

Field investigations were conducted at the Unimatic property, 21 Sherwood Lane, 30 Sherwood Lane, and the JCMUA to characterize the nature and extent of contamination and identify possible sources of contamination at the Site. Soil samples were collected from 0 to 55 feet below ground surface (bgs) as shown in Figure 3-1. Only samples collected from 0 to 10 feet bgs were evaluated for this HHRA. Samples were analyzed for target compound list volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, and target analyte list inorganics, including mercury. Samples collected during these investigations and used in the HHRA are presented in Appendix A. Samples for PCB congeners and dioxins/furans analyses were also collected and the analytical data as well as TEQ analysis and interpretations are presented in Appendix F. It is worth noting that dioxins/furans are collocated with the PCB that will be remediated.

3.2 Data Usability

All analytical data were reviewed to ensure that project requirements for representativeness, completeness, precision, and accuracy were met. A data usability report, which includes summaries of data quality assurance/quality control (QA/QC) measures, was prepared for all samples collected during the field investigation for the RI. Based on the results of the data usability assessment, the data are suitable for use in the RI, FS, and risk assessments. Data quality objective goals for completeness, comparability, and representativeness established during project planning were achieved. Data that did not meet QC criteria were appropriately qualified during data validation as “J” estimated and usable, “UJ” usable but non-detect, or “R” rejected and not usable. All data reported and evaluated in this report are usable as reported with the data validation qualifiers added except for rejected data, which were not used for project decisions. The final percentage of valid data for soil is 98.1 percent. The 90 percent completeness goal for usable data evaluated in this HHRA has been met.

3.3 Summary of Analytical Results

The evaluation and summary of analytical results are based on those chemicals that were reported at concentrations higher than the reporting limit in one or more samples. Statistical summaries, comprising the minimum and maximum detected concentrations and detection frequency for chemicals, are presented in Tables B-2.1.1 through 2.2 in Appendix B. Site-related PCBs, Aroclor 1248 and Aroclor 1254, were detected in soil.

3.4 Identification of Chemicals of Potential Concern

Many chemicals have been detected in soil from samples collected at the Site. Screening of analytical data is conducted to identify COPCs to be further evaluated in the risk assessment. Screening helps to focus the assessment on chemicals that could pose a human health risk.

The screening levels are based on Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (EPA 2015). Industrial RSLs for soil are used as screening levels for soil since future land use for the Site is industrial/commercial. To account for exposure to multiple chemicals, RSLs for chemicals based on noncancer health effects are decreased by a factor of 10 to account for a target hazard quotient (HQ) of 0.1. For chemicals without RSL values, NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (May 1999) are used as secondary screening levels.

The maximum detected concentrations are compared to screening levels to identify COPCs. Chemicals are considered COPCs if the maximum detected concentration exceeds the respective screening level. Group A carcinogens (i.e., known human carcinogens) are retained as COPCs even when they are present at the Site at concentrations below their respective screening levels. Calcium, magnesium, potassium, and sodium are essential nutrients and are not evaluated as COPCs in the HHRA. Detection frequency and chemical toxicity are also considered in the identification of COPCs. If a chemical is detected in 5 percent or less of the samples in a dataset having at least 20 samples, then the chemical is only considered a COPC if it is a Group A carcinogen. The decision process for identifying COPCs is provided in Tables B-2.1.1 through B-2.2 in Appendix B.

Risks from exposure to lead are not quantified following the exposure models for other COPCs. EPA considers lead to be a special case because of the difficulty in identifying the “threshold.” Health risks from lead are evaluated based on blood lead concentration, which can be modeled using the Integrated Exposure Uptake Biokinetic Model or the Adult Lead Model. The screening level for lead for industrial soil is 800 milligrams per kilogram (mg/kg) based on the OSWER Directive 9355.4-12 (EPA 1994). The screening process for lead is performed separately in the Lead Worksheet detailed in Table 3-1.

For indoor air screening, generic screening levels provided by EPA in *Vapor Intrusion Screening Level Calculator Version 3.4, November 2015 RSLs* are used for comparison purposes. The vapor intrusion screening levels (VISLs) are based on a cancer risk of 10^{-6} and/or an HQ of 1 for commercial buildings. The indoor air screening is provided in Appendix E.

COPCs identified in each medium for further quantitative evaluation in the HHRA are presented in Table 3-2.

Section 4

Exposure Assessment

As a component of the HHRA, the exposure assessment strives to predict human exposure to COPCs in contaminated media at the Site and in the vicinity. The exposure assessment describes exposure scenarios in which people may come into contact with site-related COPCs, provides equations and parameters to quantify exposure, and summarizes methods for evaluating exposure to lead. Results of the exposure assessment are integrated with chemical-specific toxicity information to characterize potential risks.

4.1 Exposure Pathways

Potential exposure pathways for the Site are defined based on current and potential future land uses of the Site. Each potential pathway is evaluated considering site-specific conditions to determine if the pathway could be present. The area demography and land-use characteristics are taken into consideration when the pathways are developed. If a pathway between the source of contamination and a human receptor potentially could be complete, it is retained for further evaluation.

4.1.1 Conceptual Site Model

The CSM follows the movement of site-related contaminants from the manufacturing process to the areas of concern at the Site, including the building structure, overburden soil, and groundwater. The aluminum die-casting manufacturing process was a process that spread contaminants throughout the manufacturing areas of the building. The manufacturing process resulted in contamination of building structure/materials such as walls, floors, and piping. The potential contaminant chemical types at the Site included VOCs, SVOCs, PCBs, and metals. The high heat of aluminum die casting may have caused the formation of dioxins/furans from the PCBs present in the fluid used to prepare the casting molds.

The process wastewater flowed from the floor trench drains to the drain pipe. The drain pipe discharged to the northeast property boundary onto the JCMUA property to the north. This drain pipe was later discovered to be leaking. A stormwater drain is present in the area of the former wastewater discharge pipe. This stormwater pipe eventually discharges into the main branch of Deepavaal Brook. Finally, transport of spray and particulates through building vents and windows likely contributed to the largely surficial soil contamination found in the adjacent property to the west and portions of the northern areas of the Site. Possible contamination sources, other than the manufacturing process, also included storage tanks and an onsite septic tank.

4.1.2 Identification of Exposure Pathways

As defined in the RAGS Part A (EPA 1989), an exposure pathway is composed of the following elements:

- A source and mechanism of chemical release to the environment

- An environmental transport medium (e.g., groundwater) for the released chemical and/or mechanism to transfer the chemical from one medium to another
- A point of potential contact by humans with the contaminated medium
- A route of exposure (i.e., ingestion, inhalation, or dermal contact)

In the risk assessment, pathways are identified for the No Action alternative to evaluate risk if no site remediation occurs. This assessment also assumes that no additional restrictions to site access or use exist. The goal of this evaluation is to establish whether it is feasible for individuals to engage in activities resulting in exposure to site-related contaminants.

Based on the RI, contamination was detected in soil at the Site. There are three general routes through which individuals could potentially be exposed to chemical contamination in these media: ingestion, inhalation, and dermal contact. A receptor may get small amounts of soil on his/her hands and subsequently transfer some of this soil to his/her mouth during common hand-to-mouth activity. Exposure would occur when this soil is swallowed and some contaminants in soil are absorbed in the gastrointestinal tract.

The following sections describe the potential exposure pathways and receptors under both current and potential future land-use conditions. An identified pathway does not imply that exposure is actually occurring, only that the potential exists for the pathway to be complete.

4.1.2.1 Soil Exposure Pathways

Previous sampling and continued monitoring documented soil contamination at the Site. These chemicals have been detected in both surface and subsurface soil at the Site. People working (industrial, commercial, or construction) or visiting the Site at present or in the future could be exposed to contaminants through incidental ingestion of soil, dermal contact with soil, and inhalation of particulates and volatiles released from soil. In addition, workers may be exposed to volatile COPCs via inhalation of vapors emanating into enclosed structures via vapor intrusion and into ambient air via vaporization.

4.2 Characterization of Potentially Exposed Populations

The Site is currently zoned for commercial/industrial use and is connected to the public water supply. Based on current and future land uses, exposed populations include or may include at some later date workers, trespassers, and construction/utility workers. The following subsections detail the potential exposure pathways identified for each potentially exposed population and the current and future land-use scenarios that are considered to be complete and evaluated as part of the assessment of exposure to contaminants at the Site. A summary of these exposure pathways is illustrated in Figure 4-1 and presented in Table 4-1.

4.2.1 Current and Future Workers

Current and future workers at the Site may come in contact with contaminants in surface soil through incidental ingestion of and dermal contact with soil as well as inhalation of particulates and volatiles released from surface soil. In addition, workers may be exposed to volatile COPCs via inhalation of vapors emanating into enclosed structures via vapor intrusion and into ambient

air via vaporization. Workers are evaluated using default exposure parameters recommended by EPA as described in Section 4.4.

4.2.2 Current and Future Trespassers

Trespassers could gain access to most or all areas of the Site. When trespassing, these individuals may be exposed to contaminants in surface soil through incidental ingestion of and dermal contact with soil as well as inhalation of particulates and volatiles released from surface soil. Adult trespassers (>18 years old) are evaluated using default exposure parameters recommended by EPA as described in Section 4.4.

4.2.3 Current and Future Construction/Utility Workers

Construction/utility workers could have short-term, high intensity exposure to contaminants in surface and subsurface soil via incidental ingestion of and dermal contact with soil and inhalation of particulates and volatiles released from surface and subsurface soil. Construction/utility workers are evaluated using default exposure parameters recommended by EPA as described in Section 4.4.

4.3 Calculation of Exposure Point Concentrations

This section presents the methodology that was employed to calculate the EPCs for the COPCs for each medium, including ambient air from soil particulates.

4.3.1 Exposure Point Concentrations of Samples Collected

For each dataset (representing a single chemical in soil) with at least 5 samples having 4 detected values, a 95 percent (or higher) upper confidence limit (UCL) on the arithmetic mean concentration was calculated and compared to the maximum detected concentration for that chemical. The lower value of the UCL and the maximum detected value is selected as the EPC, as recommended by EPA (1992). UCLs are not calculated for datasets with fewer than four detected concentrations. In such cases, maximum concentrations are used as the EPCs.

Several statistical methods can be used to estimate the UCL of a dataset, depending upon the data distribution. Therefore, two key steps are required to estimate the UCL of a dataset.

- Determine the distribution of the data (i.e., normal, lognormal, gamma, or neither)
- Compute the UCL using the appropriate procedure for the data distribution

In this assessment, both steps were performed with the ProUCL statistical software (EPA 2013). The ProUCL program tests the normal, lognormal, gamma, and non-parametric distributions of each dataset, and the UCLs are calculated with the statistical procedures recommended by EPA based on the findings of Singh, Singh, and Engelhardt (1997, 1999) (EPA 2013). ProUCL computes the UCL using 5 parametric and 10 non-parametric methods, depending on the distribution.

- For normal distributions, the Student's t-statistic is used to calculate the UCL.
- For lognormal distributions, one of four different computation methods is used to calculate the UCL, depending on the skewness of the data (as indicated by the standard deviation of the log-transformed data) and the sample size.

- For gamma distributions, one of two computation methods is used to calculate the UCL based on a “k value,” which is the shape parameter of a gamma distribution. For values of $k \geq 0.1$, the exposure point concentration term is computed using an adjusted gamma UCL of the mean (when $0.1 \leq k \leq 0.5$) or an approximate gamma UCL of the mean (when $k > 0.5$). For values of $k < 0.1$, a UCL is obtained using either the bootstrap-t method or Hall’s bootstrap method when the sample size is small (less than 15) or the approximate gamma for larger datasets.
- For datasets that do not fit a normal, lognormal, or gamma distribution, the ProUCL program calculates and recommends a UCL from 1 of the 10 non-parametric methods (EPA 2013).

Tables B-3.1.1 through B-3.2 in Appendix B present the EPCs for each COPC in each medium. As noted previously, the EPC is the lower value of the UCL and the maximum detected value. When there are multiple suggested UCLs, maximum value of the suggested UCLs is used. ProUCL outputs for COPCs are presented in Appendix C.

4.3.2 Exposure Concentrations for Inhalation

In accordance with EPA *RAGS Part F, Supplemental Guidance for Inhalation Exposure* (EPA 2009), inhalation exposure could be categorized as acute, subchronic, and chronic based on exposure duration and exposure pattern. Concentrations for inhalation exposure are calculated based on EPA 2009 RAGS Part F Guidance.

4.4 Exposure Parameter Assumptions

Exposure parameters for each scenario are primarily taken from EPA documents (EPA 1989, 2002, 2004, 2009, 2011, and 2014) and are consistent with EPA Region 2’s approach. EPA’s standard default assumptions (EPA 2014) or site-specific values are used. Otherwise, values from the most recent guidance available are used unless EPA Region 2 has a known preference for a specific value. Reasonable maximum exposure (RME) and central tendency exposure (CTE) equations and parameters used in the risk assessment are provided in Tables B-4.1a and B-4.1b in Appendix B. Chemical-specific dermal permeability coefficients for COPCs are presented in Table B-4.2.

4.4.1 Workers

Workers are assumed to be exposed to contaminants in surface soil. Standard default exposure assumptions are used for both RME and CTE scenarios for incidental ingestion of and dermal contact with soil, inhalation of particulates and volatiles released from surface soil (Table B-4.1a). For dermal contact with soil, the worker is assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms.

4.4.2 Trespassers

Trespassers are assumed to be exposed to contaminants in surface soil. They are assumed to spend 2 hours per visit for the RME scenario for 100 days per year (2 days per week for 50 weeks per year). One-half of the RME exposure time and frequency are used for the CTE scenario. The exposure duration is assumed to be 8 years based on number of years in the age group of 18 to 26 years old. Standard default exposure assumptions are used for both RME and CTE scenarios for incidental ingestion of and dermal contact with soil and inhalation of particulates and volatiles

released from surface soil (Table B-4.1a). The trespasser is assumed to wear a short-sleeved shirt, shorts, and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, and lower legs.

4.4.3 Construction Workers

Exposure pathways evaluated for construction workers at the Site include incidental ingestion of and dermal contact with surface and subsurface soil and inhalation of particulates. Construction workers are assumed to be exposed to soil for 8 hours per day for 5 months (100 workdays) per year for 1 year for the RME scenario. The remedial action including building demolition and soil removal is estimated to be completed within five months. For dermal contact with soil, the construction worker is assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms. Standard default exposure assumptions are used for both RME and CTE scenarios for incidental ingestion of and dermal contact with soil and inhalation of particulates and volatiles released from surface soil (Table B-4.1a).

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Section 5

Toxicity Assessment

Health criteria used in this risk assessment were obtained from a variety of toxicological sources according to a hierarchy established in the OSWER directive 9285.7-53 (EPA 2003). The toxicity value hierarchy is as follows:

- Tier 1 – EPA’s Integrated Risk Information System (IRIS)
- Tier 2 – EPA’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 EPA’s Superfund program.
- Tier 3 – Other Toxicity Values: Tier 3 includes additional EPA and non-EPA sources of toxicity information such as the California Environmental Protection Agency (Cal/EPA) and ATSDR. Priority should be 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.

5.1 Health Effects Criteria for Noncarcinogens

For chemicals that exhibit noncancer (e.g., systemic) effects, many authorities consider organisms to have repair and detoxification capabilities that must be exceeded by some critical concentration (threshold) before the health effect is manifested. This threshold view holds that a range of exposures from just above zero to some finite value can be tolerated by the organism without an appreciable risk of adverse effects.

Health criteria for chemicals exhibiting noncancer effects for use in risk assessment are generally EPA-derived reference doses (RfDs) and reference concentrations (RfCs). The RfD or RfC is an estimate of average daily exposure to an individual (including sensitive individuals) that is likely to be without appreciable risk of deleterious effects during a lifetime. The RfD is expressed in units of mg chemical per kg body weight per day (mg/kg-day) while the RfC is expressed in units of mg chemical per cubic meter of air (mg/m³).

RfDs and RfCs are usually derived either from human studies involving work-place exposures or from animal studies and are adjusted using uncertainty factors to ensure they are unlikely to underestimate the potential for adverse noncancer effects to occur. The uncertainty factors reflect scientific judgment regarding the various types of data used to estimate the RfD/RfC and range between 1 and 10. For example, a factor of 10 may be introduced to account for possible differences in response between humans and animals in prolonged exposure studies. Other factors of 10 may be used to account for variation in susceptibility among individuals in the human population, use of data from a study with less-than-lifetime exposure, and/or use of data from a study that did not identify a no-observed-adverse-effect level (NOAEL).

RfDs and RfCs provide benchmarks against which estimated doses (i.e., those projected from human exposures to various environmental conditions) might be compared. Doses that are significantly higher than the RfD/RfC may indicate an increased potential of hazard from the exposure while doses that are less than the RfD/RfC are not likely to be associated with adverse health effects. Note that an exceedance of a reference dose or concentration does not predict a specific disease.

5.2 Health Effects Criteria for Carcinogens

For chemicals that exhibit cancer effects, EPA and other scientific authorities recognize that one or more molecular events can evoke changes in a single cell or a small number of cells that can lead to malignancy. This non-threshold theory of carcinogenesis purports that any level of exposure to a carcinogen can result in some finite possibility of causing cancer. Generally, regulatory agencies assume the non-threshold hypothesis for carcinogens in the absence of information concerning the mechanisms of cancer action for the chemical. The slope factor (SF) [in units of $(\text{mg}/\text{kg body weight}\cdot\text{day})^{-1}$] is a number which, when multiplied by the lifetime average daily dose of a potential carcinogen (in $\text{mg}/\text{kg body weight}\cdot\text{day}$), yields the upper-bound lifetime excess cancer risk associated with exposure at that dose. The SF is developed for exposure through the oral route.

When the units are risk per microgram per cubic meter ($\mu\text{g}/\text{m}^3$), it is called the inhalation unit risk (IUR). The IUR is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to a chemical at a concentration of $1 \mu\text{g}/\text{m}^3$ in air. Upper-bound is a term used by EPA to reflect the conservative nature of the SFs and IURs—risks estimated using SFs and IURs are considered unlikely to underestimate actual risks and may overestimate risks for a given exposure. Excess lifetime cancer risks are generally expressed in scientific notation and are probabilities. An excess lifetime cancer risk of 1×10^{-6} (1 in 1 million), for example, represents the incremental probability that an individual will develop cancer as a result of exposure to a carcinogen over a 70-year lifetime under specified exposure conditions.

In practice, SFs and IUR estimates are derived from the results of human epidemiology studies or chronic animal bioassays. The animal studies are conducted for a range of doses, including a high dose, in order to detect possible adverse effects. Since humans are expected to be exposed at lower doses than those used in animal studies, the data are adjusted via mathematical models. The data from animal studies are typically fitted to the linearized multistage model to obtain a dose-response curve. EPA evaluates a range of possible models based on the available data before conducting the extrapolation. The most appropriate model to reflect the data is selected based on an analysis of the dataset.

The 95 percent UCL slope of the dose-response curve, subject to various adjustments and an inter-species scaling factor, is applied to derive the health protective SF and IUR estimate for humans. Dose-response data from human epidemiological studies are fitted to dose-time-response curves. These models provide rough, but reasonable, estimates of the upper limits on lifetime risk. SF and IUR estimates based on human epidemiological data are also derived using health protective assumptions and, as such, they too are considered unlikely to underestimate risks.

Therefore, while the actual risks associated with exposures to potential carcinogens are unlikely to be higher than the risks calculated using SF and IUR estimates, they could be considerably lower. In addition, there are varying degrees of confidence in the weight of evidence for carcinogenicity of a given chemical. EPA (1986) has proposed a system for characterizing the overall weight of evidence based on the availability of animal, human, and other supportive data. The weight of evidence classification is an attempt to determine the likelihood that an agent is a human carcinogen and thus qualitatively affects the estimation of potential health risks. Three major factors are considered in characterizing the overall weight of evidence for human carcinogenicity:

- The availability and quality of evidence from human studies
- The availability and quality of evidence from animal studies
- Other supportive information that is assessed to determine whether the overall weight of evidence should be modified

Under EPA's risk assessment guidelines (EPA 1986, 1996, 1999), classification of the overall weight of evidence has the following five categories:

- Group A – Human Carcinogen: There is at least sufficient evidence from human epidemiological studies to support a causal association between an agent and cancer.
- Group B – Probable Human Carcinogen: There is at least limited evidence from epidemiological studies of carcinogenicity in humans (Group B1), or in the absence of adequate data in humans, there is sufficient evidence of carcinogenicity in animals (Group B2).
- Group C – Possible Human Carcinogen: There is inadequate evidence of carcinogenicity in humans.
- Group D – Not Classified: There are inadequate data or no existing data for the chemical.
- Group E – No Evidence of Carcinogenicity in Humans: There is no evidence for carcinogenicity in at least two adequate animal tests in different species or in both epidemiological and animal studies.

The 2005 (EPA 2005) cancer guidelines provide an update to the cancer guidelines (EPA 1986, 1996, 1999). The 2005 cancer guidelines emphasize the value of understanding the biological changes that a chemical can cause and how these changes might lead to the development of cancer. They also discuss methods to evaluate and use such information, including information about an agent's postulated mode of action or the series of steps and processes that lead to cancer formation. Mode-of-action data, when available and of sufficient quality, may be useful to draw conclusions about the potency of an agent, its potential effects at low doses, whether findings in animals are relevant to humans, and which populations or life stages may be particularly susceptible. In the absence of mode-of-action information, default options are available to allow the risk assessment to proceed.

The 2005 guidelines recommend that an agent's human cancer potential be described in a weight of evidence narrative rather than the previously identified letter categories (A = known, B = probable, C = possible, D = not classifiable, and E = non-human carcinogen). The narrative summarizes the full range of available evidence and describes any conditions associated with

conclusions about an agent's hazard potential. For example, the narrative may explain that an agent appears to be carcinogenic by some routes of exposure but not others (e.g., by inhalation but not ingestion). Similarly, a hazard may be attributed to exposures during sensitive life stages of development but not at other times. The narrative also summarizes uncertainties and key default options that have been invoked.

The following are the five recommended standard hazard descriptors:

- Carcinogenic to humans
- Likely to be carcinogenic to humans
- Suggestive evidence of carcinogenic potential
- Inadequate information to assess carcinogenic potential
- Not likely to be carcinogenic to humans

EPA is evaluating the carcinogenic weight of evidence of chemicals through the IRIS chemical process. In this process, chemicals are nominated, and all chemicals are evaluated consistent with the 2005 guidelines and a narrative developed describing the weight of evidence. The IRIS chemical file is then reviewed, first through internal EPA consensus review and then external peer-review. The requirements for in-depth analysis of mode-of-action data and the review process do not allow the equating of a chemical evaluated under the old system with the letter classification using the 2005 classification narrative; rather, a full analysis of the data is required.

The 2005 cancer guidelines also include supplemental guidance on the evaluation of early lifetime exposures, including the mutagenic mode of action for carcinogenesis. The application of these adjustments is not used in the risk assessment.

5.3 Toxicity Values

Table 5-1 summarizes the chronic RfDs, and Tables 5-2 and 5-3 summarize chronic and acute RfCs used to estimate noncancer effects. In accordance with the inhalation guidance (EPA 2009), the RfC based on the next longer duration of exposure duration is used as a conservative estimate where the acute RfC is not available. Tables 5-4 and 5-5 summarize the cancer SFs and IURs used to estimate cancer risks. These criteria are the most current data, obtained from the January 2016 online version of IRIS (EPA 2016), PPRTVs provided by EPA Region 2, the February 2012 online version of Cal/EPA Office of Environmental Health Hazard Assessment Toxicity Criteria Database (OEHHA 2012), and the February 2013 online version of ATSDR (ATSDR 2013). The use of surrogate toxicity values is noted in Tables 5-1 through 5-5.

Seven polycyclic aromatic hydrocarbons (PAHs) have been classified by EPA as Group B2, probable human carcinogens. Only three PAHs were selected as COPCs. Toxicity values are currently available only for benzo(a)pyrene. Benzo(a)anthracene and benzo(b)fluoranthene are assessed using the PAH-specific relative potency factor (RPF) that expresses the potency relative to benzo(a)pyrene (EPA 1993). The RPF is applied to derive an oral SF for benzo(a)anthracene and benzo(b)fluoranthene.

Section 6

Risk Characterization

In this section of the risk assessment, the human health risks potentially associated with the complete human exposure pathways identified in Section 4 are assessed. Potential risks due to exposures to COPCs in soil from the Site are evaluated by integrating toxicity and exposure assessments into quantitative expressions of cancer risk and noncancer health hazards.

The potential for noncancer health effects is evaluated by comparing an exposure level over a specified time period with an RfD or RfC derived for a similar exposure period. This ratio of exposure to toxicity is referred to as an HQ. The hazard index (HI) is the sum of the HQs from individual chemicals and exposure routes. This HI assumes there is a level of exposure below which it is unlikely even for sensitive populations to experience adverse health effects. If the HI exceeds unity (1), there may be concern for potential noncancer effects. However, this value should not be interpreted as a probability; generally, the greater the HI is above unity, the greater the level of concern.

Cancer risks are estimated as the incremental probability of an individual to develop cancer over a lifetime as a result of exposure to a potential carcinogen. The upper-bound excess lifetime cancer risk is estimated by multiplying the lifetime exposure estimated in the exposure assessment (Section 4) by the SF or IUR identified in the toxicity assessment (Section 5). Excess lifetime cancer risks are generally expressed in scientific notation and are probabilities. An excess lifetime cancer risk of 1×10^{-6} , for example, represents the incremental probability that an individual will develop cancer as a result of exposure to a cancer chemical over a 70-year lifetime under specified exposure conditions.

In general, EPA recommends a target HI value of unity (1) and a target cancer risk range of 1×10^{-6} to 1×10^{-4} as threshold values for potential human health impacts. The results presented in the spreadsheet calculations are compared to these target values. Risks based on CTE assumptions are calculated only if the cancer risk and/or noncancer hazard calculations under the RME scenario exceed EPA's threshold values. These values aid in determining whether additional response action is necessary at the Site.

6.1 Results of Risk Calculations

Risks for all receptors are estimated using RME assumptions. Risks are also estimated using CTE assumptions when the RME assumptions resulted in risk estimates above EPA's thresholds. The comparison of RME and CTE risks provides information about the degree to which variability in and uncertainty associated with receptor behavior influence the risk estimates. CTE risks represent typical exposure patterns rather than the highest possible exposure that is reasonably expected to occur (i.e., RME). Cancer risk and noncancer hazard calculations based on the RME scenario for all COPCs are presented in RAGS Part D Tables B-7 series and summarized in RAGS Part D Tables B-9 and B-10 series in Appendix B. Cancer risk and noncancer hazard calculations based on the CTE scenario for all COPCs are presented in Appendix D. Cancer risk and noncancer health hazard estimates for each receptor by exposure area are summarized in Table 6-1.

6.1.1 Current Land-Use Scenario

6.1.1.1 Worker

The current workers may come into contact with contaminants in surface soil. The total cancer risk (5×10^{-4}) is above EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4} for the RME scenario but at the upper end of EPA's target cancer risk range under the CTE scenario (1×10^{-4}). Aroclor 1248 is the major risk driver contributing 84 percent of the cancer risk. The total noncancer HI (27) for current workers under the RME scenario is above EPA's threshold of unity. The target organ/effect HIs for the eyes (26), fingers (26), toe nails (26), and immune system (26) are also greater than one, due to exposure to Aroclor 1248 in soil. When a more typical exposure is considered under the CTE scenario, the total noncancer HI (23) is still above EPA's threshold of unity. The target organ/effect HIs for the eye (23), fingers (23), toe nails (23), and immune system (23) are still greater than one.

6.1.1.2 Trespasser

Current trespassers may come into contact with contaminants in surface soil while trespassing. Under the RME scenario, the total cancer risk (9×10^{-5}) is within EPA's target cancer risk range. The total noncancer HI (18) is above EPA's threshold of unity. The target organ/effect HIs for the eyes (18), fingers (18), toe nails (18), and immune system (18) are also greater than one, due to exposure to Aroclor 1248 in soil. When a more typical exposure is considered under the CTE scenario, the total noncancer HI (9) is still above EPA's threshold of unity. The target organ/effect HIs for the eye (9), fingers (9), toe nails (9), and immune system (9) are still above one.

6.1.1.3 Construction/Utility Worker

The current construction/utility workers may come into contact with contaminants in surface and subsurface soil while working at the Site. The total cancer risk (2×10^{-5}) is within EPA's target cancer risk range for the RME scenario. The total noncancer HI for construction workers (27) is above EPA's threshold of unity. The target organ/effect HIs for the eyes (26), fingers (26), toe nails (26), and immune system (26) are also greater than one, due to exposure to Aroclor 1248 in soil.

6.1.2 Future Land-Use Scenario

6.1.2.1 Worker

The future workers may come into contact with contaminants in surface soil. The total cancer risk (3×10^{-4}) is above EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4} for the RME scenario but at the upper end of EPA's target cancer risk range under the CTE scenario (1×10^{-4}). Similar to current worker, the primary risk driver for workers is Aroclor 1248 in surface soil. The total noncancer HI (18) for future workers under the RME scenario is above EPA's threshold of unity. The target organ/effect HIs for the eyes (18), fingers (18), toe nails (18), and immune system (18) are also greater than one, due to exposure to Aroclor 1248 in soil. When a more typical exposure is considered under the CTE scenario, the total noncancer HI (16) is still above EPA's threshold of unity. The target organ/effect HIs for the eye (15), fingers (15), toe nails (15), and immune system (15) are still greater than one.

6.1.2.2 Trespasser

Future trespassers may come into contact with contaminants in surface soil while trespassing. Under the RME scenario, the total cancer risk (6×10^{-5}) is within EPA's target cancer risk range, and the total noncancer HI (12) is above EPA's threshold of unity. The target organ/effect HIs for the eyes (12), fingers (12), toe nails (12), and immune system (12) are also greater than one, due to exposure to Aroclor 1248 in soil. When a more typical exposure is considered under the CTE scenario, the total noncancer HI (6) is still above EPA's threshold of unity. The target organ/effect HIs for the eye (6), fingers (6), toe nails (6), and immune system (6) are still greater than one.

6.1.2.3 Construction/Utility Worker

Similar to the current scenario, future construction/utility workers may come into contact with contaminants in surface and subsurface soil while working at the Site. The total cancer risk (2×10^{-5}) is within EPA's target cancer risk range for the RME scenario. The total noncancer HI for construction workers (27) is above EPA's threshold of unity. The target organ/effect HIs for the eyes (26), fingers (26), toe nails (26), and immune system (26) are also greater than one, due to exposure to Aroclor 1248 in soil.

6.2 Risk Associated with Exposure to Lead

As shown in Table 3-1, maximum concentrations of lead in soil are below EPA Regional Screening Level of 800 mg/kg for industrial soil.

6.3 Risk Associated with Vapor Intrusion

Current and future workers may be exposed to volatile COPCs via inhalation of vapor emanating into enclosed structures via vapor intrusion and into ambient air via vaporization. EPA, Region II Emergency and Remedial Response Division, and Weston Solutions, Inc. Removal Support Team 2 conducted an indoor air investigation on the Unimatic property (25 Sherwood Lane) in October 2012 (Weston 2013). Air samples were collected from seven locations at the Unimatic property and analyzed for PCB Aroclors only. For indoor air screening, all seven indoor air samples were compared to the VISL. Results of data collected by EPA and comparison to the VISL are presented in Appendix E. Aroclor 1242 was the only detected Aroclor, with all concentrations above the VISL of $0.022 \mu\text{g}/\text{m}^3$.

6.4 Uncertainty in Risk Assessment

As in any risk assessment, the estimates of potential health threats (cancer risks and noncancer health hazards) have numerous associated uncertainties. The primary areas of uncertainty and limitations are qualitatively discussed here. The main areas of uncertainty in this HHRA include environmental data, exposure parameter assumptions, toxicological data, and risk characterization.

6.4.1 Environmental Data

Uncertainty is often associated with the estimation of chemical concentrations. Errors in the analytical data may stem from errors inherent in sampling and/or laboratory procedures. One of the most effective methods to minimize procedural or systematic error is to subject the data to a strict QC review. The QC review procedure helps to eliminate many laboratory errors. However,

even with all data rigorously validated, it must be realized that error is inherent in all laboratory procedures.

Samples were collected from known and suspected areas of contamination (biased sampling) to delineate the nature and extent of contamination. Although this sampling methodology provided a reasonable estimation of the level of confidence at known or suspected contaminated areas within the Site, the possibility exists that the datasets formed by these samples do not accurately represent the level of overall contamination at the Site. The large number of soil samples taken from the Site reduces uncertainty to an acceptable level in most cases.

6.4.2 Exposure Parameter Estimation

There are two major areas of uncertainty associated with exposure parameter estimation. The first relates to the calculation of EPCs. The second relates to exposure parameter values used to estimate chemical intake.

6.4.2.1 Exposure Point Concentrations

A baseline risk assessment evaluates mean concentrations over an exposure unit, considering all exposures within that area as equally possible. Risks associated with exposures are then assessed by evaluating those average or mean concentrations with exposure factors and the appropriate exposure/toxicity values. In accordance with EPA's recommendation as implemented in ProUCL (EPA 2013) when 5 or more samples are collected with a chemical detected in at least 4 samples, the EPC for a specific chemical in a particular medium is based on the 95 percent or higher UCL of the mean or the maximum detected concentration, whichever is lower. Use of a 95 percent or higher UCL of the mean is simply to ensure that the average concentration is not underestimated.

When calculating EPCs from sampling data, any approach dealing with non-detected chemical concentrations is associated with some degree of uncertainty. This is because the non-detected result does not indicate whether the chemical is absent from the medium, present at a concentration just above zero, or present at a concentration just below the reporting limit. For chemicals that are infrequently detected, many of the values used to estimate the EPCs are based on reporting limits. High reporting limits for non-detects can lead to overestimation of risk if the actual concentrations are well below the reporting limit. However, reporting limits for the COPCs were generally toward the lower end of the detected concentrations, so the 95 percent or higher UCLs of the mean were minimally influenced by the reporting limits.

6.4.2.2 Exposure Parameters

Uncertainty is associated with the exposure parameter values used; however, assumptions are chosen to be conservative so as not to underestimate risk. For example, assumptions are made for the exposure time, frequency, and duration of potential chemical exposures as well as for the quantity of material ingested, inhaled, or absorbed. In general, assumptions are made based on reasonable maximum exposures and, in most cases, values are specified by EPA Region 2, EPA guidance documents, or site-specific information.

The choices made for exposure parameters are protective and unlikely to underestimate risks. Cancer risks and health hazards could be overestimated based on use of conservative exposure parameters in estimating risks. Certainly, the goal of estimating risks well above the average and

at the upper end of possible risks likely was achieved. Such estimates typically form the basis for risk management.

In the case of the dermal absorption factor, chemical-specific values based on EPA guidance are not available for most metals. Therefore, dermal risk associated with these chemicals cannot be quantitatively evaluated for the risk assessment, which introduces some uncertainty in total risk and total hazard estimates. However, for most chemicals, ingestion is expected to be the primary exposure pathway of concern.

6.4.3 Toxicity Values

A potentially large source of uncertainty is inherent in the derivation of EPA toxicity values (i.e., RfDs, RfCs, SFs, and IURs). In many cases, data are extrapolated from animals to sensitive humans by the application of uncertainty factors to an estimated NOAEL or lowest-observed-adverse-effect level for noncancer health effects. While designed to be protective, it is likely in many cases that uncertainty factors overestimate the magnitude of differences that may exist between humans and animals and among humans.

In addition, derivation of cancer SFs often involves linear extrapolation of effects at high doses to potential effects at lower doses commonly seen in environmental exposure settings. Currently, it is not known whether linear extrapolation is appropriate. It is probable that the shape of the dose response curve for carcinogenesis varies with different chemicals and mechanisms of action. It is not possible at this time, however, to describe such differences in quantitative terms. It is likely that the assumption of linearity is conservative and yields SFs that are unlikely to lead to underestimation of risks. Yet, for specific chemicals, current methodology could cause SFs and, hence, risks to be underestimated.

Furthermore, toxicity values are often based on observed dose-response relationships when the chemical is dissolved in water or is in some other readily soluble form. For instance, the oral SF for arsenic is based on exposure of a large Taiwanese population to dissolved arsenic in drinking water. However, chemicals in soil may exist in forms that are not readily absorbed. In this risk assessment, intakes from metals such as arsenic, organics such as PAHs, and pesticides from soil are not adjusted for relative bioavailability, which most likely overestimate risks.

Another source of uncertainty associated with toxicity is using chronic toxicity values for acute exposure. Inhalation RfCs are derived for acute and chronic exposures based on the exposure duration and exposure pattern (EPA 2009). Chronic exposure is generally used for continuous or near-continuous inhalation exposures that occur for 7 years or longer such as for resident and worker exposure. Acute exposure includes exposures lasting 24 hours or less or intermittent exposures that occur for a series of short periods (e.g., 4 hours) separated by several days of no exposure. Acute RfCs are not available for some metals. In accordance with RAGS Part F (EPA 2009), the RfC based on the next longer exposure duration is used as a conservative estimate that would be protective for the shorter exposure duration. This source of uncertainty may overestimate the potential inhalation hazard for trespassers.

Chromium can exist in several oxidation states ranging from chromium (II) to hexavalent chromium (VI). Only two oxidation states, chromium (III) and chromium (VI), are widely studied because of their predominance and stability in the ambient environment and their toxicological

characteristics. Chromium (III) is poorly absorbed, regardless of the route of exposure, whereas chromium (VI) is more readily absorbed. Toxicological studies show that chromium (VI) is generally more toxic than chromium (III). Chromium (VI) is classified as a Group A – known human carcinogen by the inhalation route of exposure (EPA 2015). This risk assessment utilized an oral SF of 0.5 per mg/kg-day for chromium (VI) developed by the NJDEP. Total chromium, not valence-specific, data were collected from the Site. In the absence of valence-specific data, total chromium is evaluated using the chromium (VI) toxicity criteria. This assumption is very conservative since chromium in soil is generally dominated by the much less toxic trivalent form. Thus, the use of chromium (VI) toxicity values overestimates the risk attributed to total chromium.

6.4.4 Risk Characterization

There is also uncertainty in assessing the risks associated with a mixture of chemicals. In this assessment, the effects of exposure to each contaminant present initially have been considered separately. However, these substances occur together at the Site, and individuals may be exposed to mixtures of the chemicals. Predictions of how these mixtures of chemicals will interact must be based on an understanding of the mechanisms of such interactions. Individual chemicals may interact chemically in the body, yielding a new toxic component or causing different effects at different target organs. Suitable data are not currently available to rigorously characterize the effects of chemical mixtures. Consequently, as recommended by EPA (1989), chemicals present at the Site are assumed to act additively, and potential health risks are evaluated by summing excess lifetime cancer risks and calculating HIs for noncancer health effects.

This approach to assessing risk associated with mixtures of chemicals assumes there are no synergistic or antagonistic interactions among the chemicals, and all chemicals have the same toxic endpoint and mechanisms of action. To the extent that these assumptions are correct, the actual risks could be underestimated or overestimated.

As a result of the uncertainties described above, this risk assessment should not be construed as presenting absolute risks or hazards. Rather, it is a conservative analysis intended to indicate the potential for adverse impacts to occur based on the RME and CTE scenarios.

Section 7

Summary and Conclusions

7.1 Approach

COPCs are identified based on criteria outlined in RAGS (EPA 1989), primarily through comparison to risk-based screening levels. COPCs identified for further quantitative evaluation in the HHRA are primarily pesticides/PCBs and inorganics as listed in Table 3-2. In the HHRA, contaminants in soil at the Site are evaluated for potential health threats to the following receptors: workers, trespassers, and construction/utility workers.

Exposure routes and human receptor groups are identified, and quantitative estimates of the magnitude, frequency, and duration of exposure are made. Exposure point concentrations are estimated using the lower of the UCL and the maximum detected concentration. Daily intakes are calculated based on the RME scenario (the highest exposure reasonably expected to occur at a site). The intent is to estimate a conservative exposure case that is still within the range of possible exposures. CTE assumptions are also developed, which reflect more typical exposures.

In the toxicity assessment, current toxicological human health data (i.e., RfDs, RfCs, SFs, and IURs) are obtained from various sources and utilized in the order specified by EPA (2003). Risk characterization involves integrating the exposure and toxicity assessments into quantitative expressions of risks/health effects. Specifically, daily intakes are compared with concentrations known or suspected to present health risks or hazards. The estimates of cancer risk and noncancer health hazards, and the greatest chemical contributors to these estimates, are identified.

In general, EPA recommends target values or ranges (i.e., cancer risk of 10^{-6} to 10^{-4} or HI of 1) as threshold values for potential human health impacts (EPA 1989). These target values aid in determining whether additional response action is necessary at the Site.

7.2 Summary of Risks

This section presents a summary of the cancer risks and noncancer health hazards for exposures to contaminants at the Site that are quantitatively evaluated for potential health threats.

7.2.1 Current Land-Use Scenario

7.2.1.1 Cancer Risk

The total cancer risk estimates for the RME scenario are listed below. When RME risks exceed EPA's target range of 1×10^{-6} to 1×10^{-4} , CTE risks are also provided.

- Workers: RME: 5×10^{-4} ; CTE: 1×10^{-4}
- Trespassers: 9×10^{-5}
- Construction/Utility Workers: 2×10^{-5}

Based on the results above, the estimated cancer risks for all current receptors are either above or within EPA's target range of 1×10^{-6} to 1×10^{-4} under the RME scenario but within EPA's target risk range under the CTE scenario.

7.2.1.2 Noncancer Health Hazard

The estimated organ/effect HIs for the RME scenario are listed below.

- Workers:
 - RME: Total 27; eyes 26, fingers 26, immune system 26, toe nails 26
 - CTE: Total 23; eyes 23, fingers 23, immune system 23, toe nails 23
- Trespassers:
 - RME: Total 18; eyes 18, fingers 18, immune system 18, toe nails 18
 - CTE: Total 9; eyes 9, fingers 9, immune system 9, toe nails 9
- Construction/Utility Workers:
 - RME: Total 27; eyes 26, fingers 26, immune system 26, toe nails 26

Based on the results above, the total HIs for all current receptors under both RME and CTE scenarios are above EPA's threshold of unity. The noncancer HIs for eyes, fingers, toe nails, and immune system exceed EPA's threshold of unity due to exposure to Aroclor 1248.

7.2.2 Future Land-Use Scenario

7.2.2.1 Cancer Risk

The total incremental lifetime cancer risk estimates for the RME scenario are listed below. When RME risks exceed EPA's target range of 1×10^{-6} to 1×10^{-4} , CTE risks are also provided.

- Workers: RME: 3×10^{-4} ; CTE: 1×10^{-4}
- Trespassers: 6×10^{-5}
- Construction/Utility Workers: 2×10^{-5}

Based on the results above, the estimated cancer risks for all current receptors are either above or within EPA's target range of 1×10^{-6} to 1×10^{-4} for the RME scenario but within EPA's target risk range under the CTE scenario.

7.2.2.2 Noncancer Health Hazard

The estimated organ/effect HIs for the RME scenario are listed below.

- Workers:
 - RME: Total 18; eyes 18, fingers 18, immune system 18, toe nails 18
 - CTE: Total 16; eyes 16, fingers 16, immune system 16, toe nails 16
- Trespassers:
 - RME: Total 12; eyes 12, fingers 12, immune system 12, toe nails 12
 - CTE: Total 6; eyes 6, fingers 6, immune system 6, toe nails 6

- Construction/Utility Workers:
 - RME: Total 27; eyes 26, fingers 26, immune system 26, toe nails 26

Based on the results above, the total HIs for all current receptors under both RME and CTE scenarios are above EPA's threshold of unity. The noncancer HIs for eyes, fingers, toe nails, and immune system exceed EPA's threshold of unity due to exposure to Aroclor 1248.

7.2.3 Risk Associated with Lead

Maximum concentrations of lead in soils are below EPA Regional Screening Level of 800 mg/kg for industrial soil.

7.2.4 Risk Associated with Vapor Intrusion

Indoor air investigation conducted at the Unimatic property showed that Aroclor 1242 was the only detected Aroclor in seven indoor air samples. Concentrations of Aroclor 1242 in all indoor air samples are above the VISL ($0.022 \mu\text{g}/\text{m}^3$) indicated that current and future workers may be exposed via inhalation of vapor emanating into enclosed structures via vapor intrusion and into ambient air via vaporization.

7.3 Conclusions

For the current and future land-use scenarios, the estimated cancer risks for trespassers and construction/utility workers are within EPA's target range of 1×10^{-6} to 1×10^{-4} under the RME scenario. Risks for current and future workers are higher than EPA's target cancer risk range due to Aroclor 1248 but at the upper end of EPA's target cancer risk range under the CTE scenario. The total HIs for all current and future receptors under both RME and CTE scenarios are above EPA's threshold of unity (1). The noncancer HIs for eyes, fingers, toe nails, and immune system exceed EPA's threshold of unity due to exposure to Aroclor 1248.

Lead was evaluated separately and does not appear to be a concern for all receptors evaluated under both current and future land-use scenarios. Results of indoor air screening indicated that current and future workers could be exposed specifically to concentrations of Aroclor 1242 via inhalation of vapor emanating into enclosed structures via vapor intrusion and into ambient air via vaporization.

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Section 8

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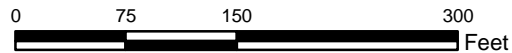
Figures

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Legend

 Property Boundary

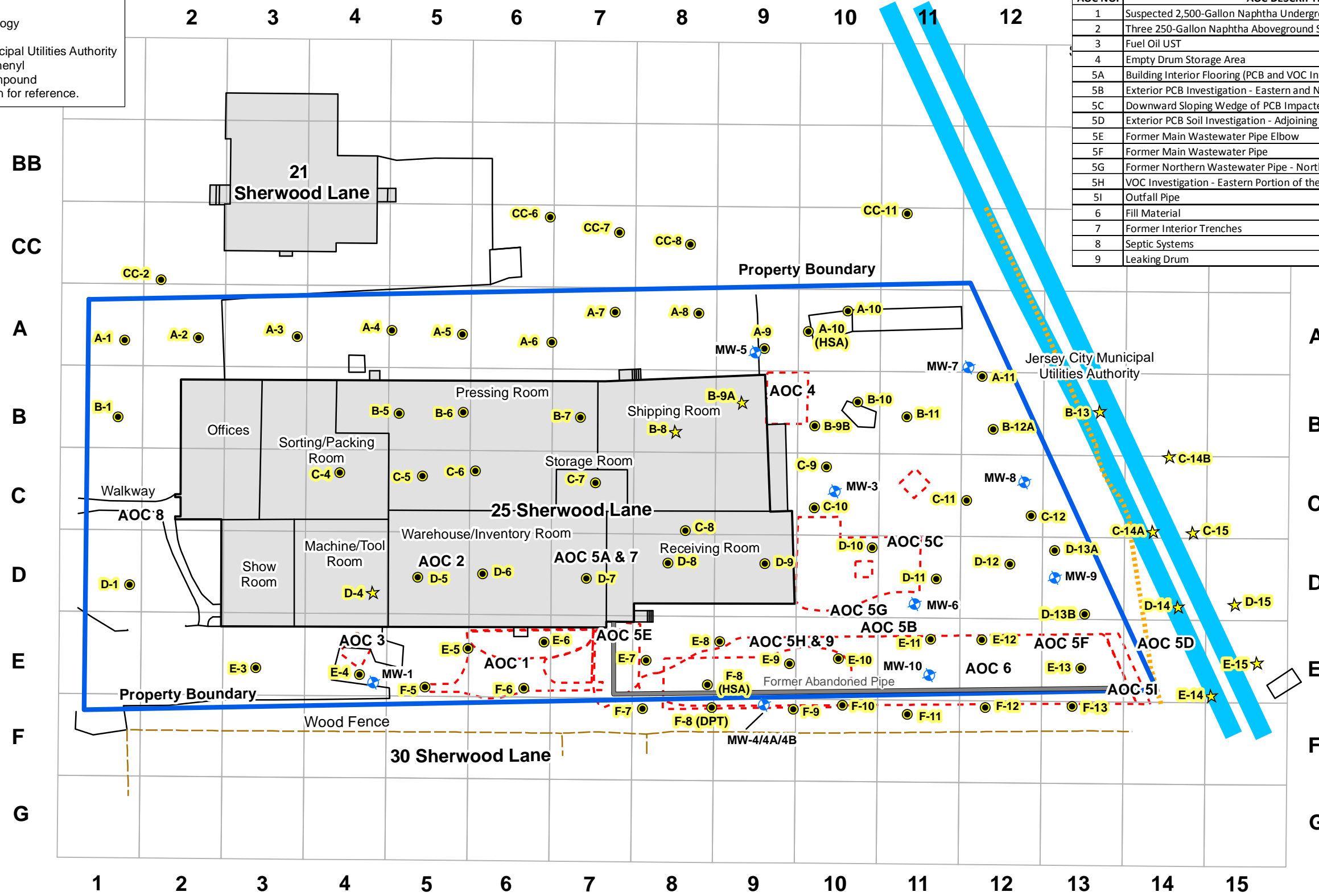


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Figure 2-1
Site Location Map
Unimatic Manufacturing Corporation Superfund Site
Fairfield, Essex County, New Jersey

Notes:
 1. AOC - Area of concern
 2. DPT - Direct Push Technology
 3. HSA - Hollow Stem Auger
 4. JCMUA - Jersey City Municipal Utilities Authority
 5. PCB - Polychlorinated biphenyl
 6. VOC - Volatile organic compound
 7. Monitoring wells are shown for reference.

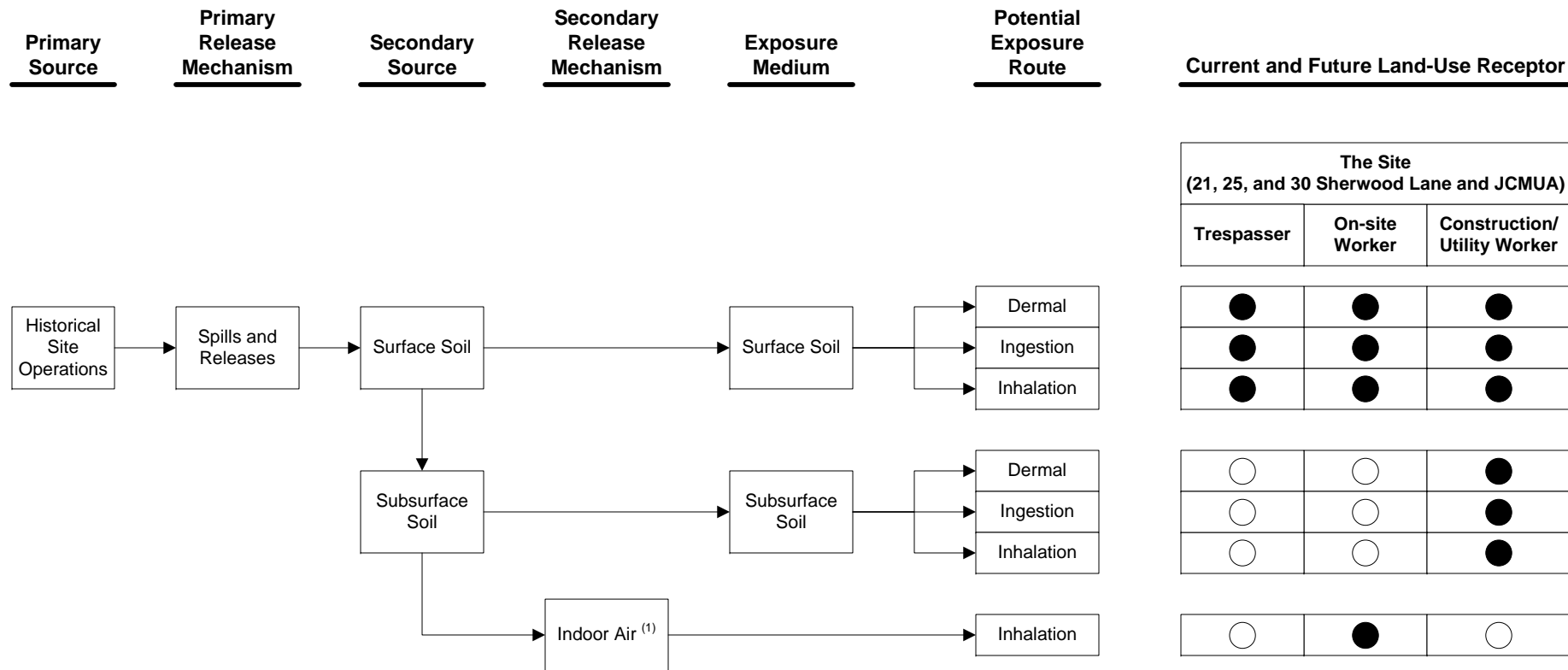
AOC NO.	AOC DESCRIPTION
1	Suspected 2,500-Gallon Naphtha Underground Storage Tank (UST)
2	Three 250-Gallon Naphtha Aboveground Storage Tanks (ASTs)
3	Fuel Oil UST
4	Empty Drum Storage Area
5A	Building Interior Flooring (PCB and VOC Investigation)
5B	Exterior PCB Investigation - Eastern and Northern Portions of the Site
5C	Downward Sloping Wedge of PCB Impacted Soils North of the Building
5D	Exterior PCB Soil Investigation - Adjoining JCMUA Property
5E	Former Main Wastewater Pipe Elbow
5F	Former Main Wastewater Pipe
5G	Former Northern Wastewater Pipe - Northwestern Portion
5H	VOC Investigation - Eastern Portion of the Site
5I	Outfall Pipe
6	Fill Material
7	Former Interior Trenches
8	Septic Systems
9	Leaking Drum



- Soil Boring
- ★ Hand Auger Boring
- ⊕ Monitoring Well
- Former Abandoned Pipe
- Approximate Toe of Slope
- Property Boundary
- JCMUA Pipeline
- Excavation Area

Figure 3-1
Soil Sample Locations
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, Essex County, New Jersey





Legend:

- complete exposure pathway
- incomplete/insignificant exposure pathway

Note:

Trespasser: Adult

JCMUA: Jersey City Municipal Utilities Authority

⁽¹⁾ Indoor air screening evaluation will be performed for 25 Sherwood Lane based on data from EPA/Weston Removal Assessment Investigation report, dated February 2013

Tables

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**TABLE 3-1
LEAD WORKSHEET**

Site Name: Unimatic Manufacturing Corporation Superfund Site
Receptor: Site Worker (Adult), Construction Worker (Adult), Trespasser (Adult)

A. EXPOSURE SCENARIO: NON-RESIDENTIAL

1. Lead Screening Questions

Medium	Maximum Concentration		Screening Level		Basis for Screening Level Value
	Value	Unit	Value	Unit	
Surface Soil (Current Scenario)	130	mg/kg	800	mg/kg	EPA Regional Screening Level for industrial soil
Surface Soil (Future Scenario)	181	mg/kg	800	mg/kg	EPA Regional Screening Level for industrial soil
Surface/Subsurface Soil	181	mg/kg	800	mg/kg	EPA Regional Screening Level for industrial soil

Note: If the Adult Lead Model is used, designate the baseline blood lead level and geometric standard deviation used to calculate the screening level.

2. Lead Model Questions

Question	Response for Non-Residential Lead Model
Was a lead model used? (If "no" explain rationale)	No. The maximum lead concentrations are below respective screening levels. Therefore, further analysis using a lead model is not warranted.
Which lead model and what version/date was used?	NA
Where are the input values located in the risk assessment report?	NA
Where are the output values located in the risk assessment report?	NA
Was the model run using default values only?	NA
If non-default values were used, where are the rationale for those values located in the risk assessment report?	NA

3. Final Result

Medium	Result	Comment
NA	NA	NA

TABLE 3-2
LIST OF CHEMICALS OF POTENTIAL CONCERN
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemicals	Current Land-Use	Future Land-Use	
	Surface Soil	Surface Soil	Surface/ Subsurface Soil
Volatile Organic Compounds			
Trichloroethene	Yes	Yes	Yes
Semi-volatile Organic Compounds			
Benzo(a)anthracene	No	No	Yes
Benzo(a)pyrene	Yes	Yes	Yes
Benzo(b)fluoranthene	Yes	Yes	Yes
Pesticides/Polychlorinated Biphenyls			
4,4'-DDE	No	No	Yes
4,4'-DDT	No	No	Yes
Aldrin	Yes	Yes	Yes
Alpha-Chlordane	No	No	Yes
Aroclor 1248	Yes	Yes	Yes
Aroclor 1254	Yes	Yes	Yes
Delta-BHC	No	Yes	Yes
Dieldrin	Yes	Yes	Yes
Gamma-Chlordane	Yes	Yes	Yes
Heptachlor	Yes	Yes	Yes
Heptachlor Epoxide	Yes	Yes	Yes
Inorganics			
Arsenic	Yes	Yes	Yes
Chromium	Yes	Yes	Yes
Iron	No	No	Yes
Manganese	Yes	Yes	Yes

Yes = Selected as COPC

No = Not Selected as COPC

TABLE 4-1
SELECTION OF EXPOSURE PATHWAYS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor (Age)	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway	
Current and Future	Soil	Surface Soil	The Site (21, 25, and 30 Sherwood Lane and JCMUA)	On-site Worker	Adult	Dermal	Quant	Workers may come into contact with contaminants in surface soil and/or inhale fugitive dust and volatile chemicals while working at the site.	
						Ingestion	Quant		
						Inhalation	Quant		
			The Site (21, 25, and 30 Sherwood Lane and JCMUA)	Trespasser	Adult	Dermal	Quant		Trespassers may come into contact with contaminants in surface soil and/or inhale fugitive dust and volatile chemicals while visiting the site.
						Ingestion	Quant		
						Inhalation	Quant		
		Indoor Air	25 Sherwood Lane ⁽¹⁾	On-site Worker	Adult	Inhalation	Qual	Workers may be exposed to contaminants in indoor air via vapor intrusion pathway. Indoor air concentrations are screened against the Vapor Intrusion Screening Levels in the risk assessment.	
		Surface and Subsurface Soil	The Site (21, 25, and 30 Sherwood Lane and JCMUA)	Construction/Utility Worker	Adult	Dermal	Quant	Construction workers may come into contact with contaminants in soil and/or inhale fugitive dust and volatile chemicals while working at the site.	
						Ingestion	Quant		
						Inhalation	Quant		

Note:

Quant = Quantitative risk analysis performed

Qual = Qualitative risk analysis performed

JCMUA = Jersey City Municipal Utilities Authority

⁽¹⁾ Polychlorinated biphenyls Aroclors data provided in EPA/Weston Removal Assessment Investigation report, dated February 2013, are used for indoor air screening evaluation

TABLE 5-1
NONCANCER TOXICITY DATA - ORAL/DERMAL
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed RfD for Dermal ⁽²⁾		Primary Target Organ	Combined Uncertainty/ Modifying Factor	Source	Date ⁽³⁾
		Value	Unit		Value	Unit				
Volatile Organic Compounds										
Trichloroethene	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Heart/ Immune System/ Developmental/Kidney	10 to 1,000	IRIS	1/11/2016
Semi-volatile Organic Compounds										
Benzo(a)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
PCBs/Pesticides										
4,4'-DDE	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
4,4'-DDT	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	100	IRIS	1/11/2016
Aldrin	Chronic	3.0E-05	mg/kg-day	1	3.0E-05	mg/kg-day	Liver	1,000	IRIS	1/11/2016
Alpha-Chlordane ⁽⁴⁾	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	300	IRIS	1/11/2016
Aroclor 1248 ⁽⁵⁾	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye/Finger/Toe Nail/Immune System	300	IRIS	1/11/2016
Aroclor 1254	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye/Finger/Toe Nail/Immune System	300	IRIS	1/11/2016
Delta-BHC	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Dieldrin	Chronic	5.0E-05	mg/kg-day	1	5.0E-05	mg/kg-day	Liver	100	IRIS	1/11/2016
Gamma-Chlordane ⁽⁴⁾	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	300	IRIS	1/11/2016
Heptachlor	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	300	IRIS	1/11/2016
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg-day	1	1.3E-05	mg/kg-day	Liver	1,000	IRIS	1/11/2016
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin	3	IRIS	1/11/2016
Chromium ⁽⁶⁾	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None reported	300	IRIS	1/11/2016
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	GI Tract	1.5	PPRTV	9/11/2006
Manganese	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	1/11/2016

⁽¹⁾ Oral Absorption Efficiency for Dermal from Regional Screening Levels, November 2015
<http://www.epa.gov/region09/waste/sfund/prg/index.html>

⁽²⁾ Adjusted RfD for Dermal = Oral RfD x Oral Absorption Efficiency for Dermal.

⁽³⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
 Date shown for other sources is the publication date.

⁽⁴⁾ based on chlordane (technical)

⁽⁵⁾ based on Aroclor 1254

⁽⁶⁾ based on chromium (VI)

Definition:

CNS = central nervous system

GI = gastrointestinal

IRIS = Integrated Risk Information System

mg/kg-day = milligram per kilogram per day

NA = not available

PPRTV = Provisional Peer Reviewed Toxicity Value

RfD = reference dose

TABLE 5-2
NONCANCER TOXICITY DATA - INHALATION (CHRONIC)
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/Modifying Factor	RfC Target Organ	
	Value	Unit			Source	Date ⁽¹⁾
Volatile Organic Compounds						
Trichloroethene	2.0E-03	mg/m ³	Heart/Immune System/Liver	10 to 100	IRIS	1/11/2016
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDE	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA
Alpha-Chlordane ⁽²⁾	7.0E-04	mg/m ³	Liver	1,000	IRIS	1/11/2016
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Gamma-Chlordane ⁽²⁾	7.0E-04	mg/m ³	Liver	1,000	IRIS	1/11/2016
Heptachlor	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Arsenic	1.5E-05	mg/m ³	Developmental/Cardiovascular System/ Nervous System/Lung/Skin	30	Cal/EPA	1/11/2016
Chromium ⁽³⁾	1.0E-04	mg/m ³	Lung	300	IRIS	1/11/2016
Iron	NA	NA	NA	NA	NA	NA
Manganese	5.0E-05	mg/m ³	CNS	1,000	IRIS	1/11/2016

⁽¹⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
 Date shown for other sources is the publication date.

⁽²⁾ based on chlordane (technical)

⁽³⁾ based on chromium (VI) particulates

Definition:

Cal/EPA = California Environmental Protection Agency

CNS = central nervous system

IRIS = Integrated Risk Information System

mg/m³ = milligram per cubic meter

NA = not available

RfC = reference concentration

TABLE 5-3
NONCANCER TOXICITY DATA - INHALATION (ACUTE)
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source	Date ⁽¹⁾
Volatile Organic Compounds						
Trichloroethene	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDE	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA
Alpha-Chlordane ⁽²⁾	2.0E-04	mg/m ³	Liver	100	ATSDR	10/2015
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Gamma-Chlordane ⁽²⁾	2.0E-04	mg/m ³	Liver	100	ATSDR	10/2015
Heptachlor	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Arsenic	2.0E-04	mg/m ³	Developmental/Cardiovascular System/Nervous System	1,000	Cal/EPA	1/11/2016
Chromium ⁽³⁾	3.0E-04	mg/m ³	Respiratory System	30	ATSDR	7/12/2013
Iron	NA	NA	NA	NA	NA	NA
Manganese	1.7E-04	mg/m ³	Nervous System	300	Cal/EPA	1/11/2016

⁽¹⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris>
 Date shown for other sources is the publication date.

⁽²⁾ based on chlordane (technical)

⁽³⁾ based on chromium (VI), particulates

Definition:

ATSDR = Agency for Toxic Substances and Disease Registry

Cal/EPA = California Environmental Protection Agency

mg/m³ = milligram per cubic meter

NA = not available

RfC = reference concentration

TABLE 5-4
CANCER TOXICITY DATA - ORAL/DERMAL
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed Slope Factor for Dermal ⁽²⁾		Mutagen ⁽³⁾	Weight of Evidence/ Cancer Guideline Description	Source	Date ⁽⁴⁾
	Value	Unit		Value	Unit				
Volatile Organic Compounds									
Trichloroethene ⁽⁵⁾	4.6E-02	(mg/kg-day) ⁻¹	1	4.6E-02	(mg/kg-day) ⁻¹	M	carcinogenic to humans	IRIS	1/11/2016
Semi-volatile Organic Compounds									
Benzo(a)anthracene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	M	B2	EPA	7/1/1993
Benzo(a)pyrene	7.3E+00	(mg/kg-day) ⁻¹	1	7.3E+00	(mg/kg-day) ⁻¹	M	B2	IRIS	1/11/2016
Benzo(b)fluoranthene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	M	B2	EPA	7/1/1993
Pesticides/Polychlorinated Biphenyls									
4,4'-DDE	3.4E-01	(mg/kg-day) ⁻¹	1	3.4E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
4,4'-DDT	3.4E-01	(mg/kg-day) ⁻¹	1	3.4E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Aldrin	1.7E+01	(mg/kg-day) ⁻¹	1	1.7E+01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Alpha-Chlordane ⁽⁶⁾	3.5E-01	(mg/kg-day) ⁻¹	1	3.5E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1248 ⁽⁷⁾	2.0E+00	(mg/kg-day) ⁻¹	1	2.0E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1254 ⁽⁷⁾	2.0E+00	(mg/kg-day) ⁻¹	1	2.0E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Delta-BHC ⁽⁸⁾	1.8E+00	(mg/kg-day) ⁻¹	1	1.8E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Dieldrin	1.6E+01	(mg/kg-day) ⁻¹	1	1.6E+01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Gamma-Chlordane ⁽⁶⁾	3.5E-01	(mg/kg-day) ⁻¹	1	3.5E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor	4.5E+00	(mg/kg-day) ⁻¹	1	4.5E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor Epoxide	9.1E+00	(mg/kg-day) ⁻¹	1	9.1E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Inorganics									
Arsenic	1.5E+00	(mg/kg-day) ⁻¹	1	1.5E+00	(mg/kg-day) ⁻¹	--	A	IRIS	1/11/2016
Chromium ⁽⁹⁾	5.0E-01	(mg/kg-day) ⁻¹	0.025	5.0E-01	(mg/kg-day) ⁻¹	--	likely to be carcinogenic to humans	NJDEP	4/8/2009
Iron	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Manganese	NA	NA	0.04	NA	NA	--	D	IRIS	1/11/2016

TABLE 5-4
CANCER TOXICITY DATA - ORAL/DERMAL
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

- ⁽¹⁾ Oral Absorption Efficiency for Dermal from Regional Screening Levels, November 2015
<http://www.epa.gov/region09/waste/sfund/prg/index.html>
- ⁽²⁾ Oral slope factor (SF) for Dermal = Oral SF
- ⁽³⁾ Identified as a mutagen on the Regional Screening Level Table, November 2015
- ⁽⁴⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
Date shown for other sources is the publication date.
- ⁽⁵⁾ TCE is considered carcinogenic by a mutagenic mode of action for induction of kidney tumors.
The adult-based oral SF for kidney cancer is 9.3×10^{-3} per mg/kg/day
- ⁽⁶⁾ based on chlordane (technical)
- ⁽⁷⁾ based on upper-bound SF for high risk and persistence polychlorinated biphenyls
- ⁽⁸⁾ based on technical BHC
- ⁽⁹⁾ based on chromium (VI)

Definition:
EPA = EPA Provisional Guidance for Quantitative Assessment of
Polycyclic Aromatic Hydrocarbons
IRIS = Integrated Risk Information System
M = mutagen
mg/kg-day = milligram per kilogram per day
NA = not available
NJDEP = New Jersey Department of Environmental Protection
PPRTV = Provisional Peer Reviewed Toxicity Value

EPA Weight of Evidence (EPA 1986, EPA 1996):

- A - Human carcinogen
- B1 - Probable human carcinogen
indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in
animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as human carcinogen

EPA Weight of Evidence Narrative (EPA 2005):

- Carcinogenic to human
- Likely to be carcinogenic to humans
- Suggestive evidence of carcinogenic potential
- Inadequate information to assess carcinogenic potential
- Not likely to be carcinogenic to humans

TABLE 5-5
CANCER TOXICITY DATA - INHALATION
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Inhalation Unit Risk		Mutagen ⁽¹⁾	Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value	Unit			Source	Date ⁽²⁾
Volatile Organic Compounds						
Trichloroethene ⁽³⁾	4.1E-06	($\mu\text{g}/\text{m}^3$) ⁻¹	M	carcinogenic to humans	IRIS	1/11/2016
Semi-volatile Organic Compounds						
Benzo(a)anthracene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	M	B2	Cal/EPA	1/11/2016
Benzo(a)pyrene	1.1E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	M	B2	Cal/EPA	2011
Benzo(b)fluoranthene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	M	B2	Cal/EPA	1/11/2016
Pesticides/Polychlorinated Biphenyls						
4,4'-DDE	9.7E-05	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	CalEPA	1/11/2016
4,4'-DDT	9.7E-05	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Aldrin	4.9E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Alpha-Chlordane ⁽⁴⁾	1.0E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1248 ⁽⁵⁾	5.7E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1254 ⁽⁵⁾	5.7E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Delta-BHC ⁽⁶⁾	5.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	D	IRIS	1/11/2016
Dieldrin	4.6E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Gamma-Chlordane ⁽⁴⁾	1.0E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor	1.3E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor Epoxide	2.6E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Inorganics						
Arsenic	4.3E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	A	IRIS	1/11/2016
Chromium ⁽⁷⁾	1.2E-02	($\mu\text{g}/\text{m}^3$) ⁻¹	--	A	IRIS	1/11/2016
Iron	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Manganese	NA	NA	--	D	IRIS	1/11/2016

TABLE 5-5
CANCER TOXICITY DATA - INHALATION
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

- | | |
|---|---|
| <p>(1) Identified as a mutagen on the Regional Screening Level (RSL) Table, January 2015, http://www.epa.gov/region09/waste/sfund/prg/index.html</p> <p>(2) Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/
Date shown for other sources is the publication date.</p> <p>(3) TCE is considered carcinogenic by a mutagenic mode of action for induction of kidney tumors. The adult-based IUR for kidney cancer is 1×10^{-6} per $\mu\text{g}/\text{m}^3$.</p> <p>(4) based on chlordane (technical)</p> <p>(5) based on upper-bound IUR for the high risk polychlorinated biphenyls</p> <p>(6) based on technical BHC</p> <p>(7) based on chromium (VI)</p> | <p>Definition:
 Cal/EPA = California Environmental Protection Agency
 IRIS = Integrated Risk Information System
 M = mutagen
 NA = not available
 $\mu\text{g}/\text{m}^3$ = microgram per cubic meter
 PPRTV = Provisional Peer Reviewed Toxicity Value</p> |
|---|---|

EPA Weight of Evidence (EPA 1986, EPA 1996):

- A - Human Carcinogen
- B1 - Probable human carcinogen
indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as human carcinogen

EPA Weight of Evidence Narrative (EPA 2005):

- Carcinogenic to human
- Likely to be carcinogenic to humans
- Suggestive evidence of carcinogenic potential
- Inadequate information to assess carcinogenic potential
- Not likely to be carcinogenic to humans

TABLE 6-1
SUMMARY OF CANCER RISKS AND NONCANCER HEALTH HAZARDS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Time Frame	Receptor	Cancer Risk ⁽¹⁾			Noncancer Hazard Index ⁽²⁾			
		RME	Risk Driver	CTE	RME	Organ/Effect (Risk Driver)	CTE	Organ/Effect (Risk Driver)
Current	Worker	5 × 10⁻⁴	Aroclor 1248 (4 × 10 ⁻⁴)	1 × 10 ⁻⁴	27	Aroclor 1248 - HI eyes: 26 - HI fingers: 26 - HI immune system: 26 - HI toe nails: 26	23	Aroclor 1248 - HI eyes: 23 - HI fingers: 23 - HI immune system: 23 - HI toe nails: 23
	Trespasser	9 × 10 ⁻⁵	--	--	18	Aroclor 1248 - HI eyes: 18 - HI fingers: 18 - HI immune system: 18 - HI toe nails: 18	9	Aroclor 1248 - HI eyes: 9 - HI fingers: 9 - HI immune system: 9 - HI toe nails: 9
	Construction/Utility Worker	2 × 10 ⁻⁵	--	--	27	Aroclor 1248 - HI eyes: 26 - HI fingers: 26 - HI immune system: 26 - HI toe nails: 26	--	
Future	Worker	3 × 10⁻⁴	Aroclor 1248 (3 × 10 ⁻⁴)	1 × 10 ⁻⁴	18	Aroclor 1248 - HI eyes: 18 - HI fingers: 18 - HI immune system: 18 - HI toe nails: 18	16	Aroclor 1248 - HI eyes: 15 - HI fingers: 15 - HI immune system: 15 - HI toe nails: 15
	Trespasser	6 × 10 ⁻⁵	--	--	12	Aroclor 1248 - HI eyes: 12 - HI fingers: 12 - HI immune system: 12 - HI toe nails: 12	6	Aroclor 1248 - HI eyes: 6 - HI fingers: 6 - HI immune system: 6 - HI toe nails: 6
	Construction/Utility Worker	2 × 10 ⁻⁵	--	--	27	Aroclor 1248 - HI eyes: 26 - HI fingers: 26 - HI immune system: 26 - HI toe nails: 26	--	

RME = reasonable maximum exposure
 CTE = central tendency exposure

Notes:

-- not calculated

⁽¹⁾ Bolded values exceed EPA's target range of 1x10⁻⁶ to 1x10⁻⁴

⁽²⁾ Bolded values exceed EPA's threshold of unity (1)

Appendix A

List of Samples Used in the Risk Assessment

Table A-1 Soil Sample List

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TABLE A-1

SOIL SAMPLE LIST

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Location	Sample ID	Sample Date	Sample Depth (feet)	Surface Soil			Subsurface Soil	Analysis			
				Under Pavement?	Current Land Use	Future Land Use		VOC	SVOC Pesticides	Pesticides	Metal
A-1	SB-A-1-A	6/22/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-1	SB-A-1-B	6/22/2015	2 - 5	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-10	SB-A-10-A	6/19/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-10	SB-A-10-B	6/19/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-10	SB-A-10-C	6/19/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-11	SB-A-11-A	6/19/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
A-11	SB-A-11-B	6/19/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-11	SB-A-11-C	6/19/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-2	SB-A-2-A	6/22/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-2	SB-A-2-B	6/22/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-2	SB-A-2-C	6/22/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-3	SB-A-3-A	6/22/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-3	SB-A-3-B	6/22/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-3	SB-A-3-C	6/22/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-4	SB-A-4-A	6/22/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-4	SB-A-4-B	6/22/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-4	SB-A-4-C	6/22/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-5	SB-A-5-A	6/23/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-5	SB-A-5-B	6/23/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-5	SB-A-5-C	6/23/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-6	SB-A-6-A	6/22/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-6	SB-A-6-B	6/22/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-6	SB-A-6-C	6/22/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-7	SB-A-7-A	6/23/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-7	SB-A-7-B	6/23/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-7	SB-A-7-C	6/23/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-8	SB-A-8-A	6/23/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
A-8	SB-A-8-B	6/23/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-8	SB-A-8-C	6/23/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
A-9	SB-A-9-A	6/19/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
A-9	SB-A-9-B	6/19/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
A-9	SB-A-9-C	6/19/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-1	SB-B-1-A	6/24/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B-1	SB-B-1-B	6/24/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-1	SB-B-1-C	6/24/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-10	SB-B-10-A	6/16/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B-10	SB-B-10-B	6/16/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-10	SB-B-10-C	6/16/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-11	SB-B-11-A	6/17/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B-11	SB-B-11-B	6/17/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-11	SB-B-11-C	6/17/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-12A	SB-B-12A-A	6/17/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B-12A	SB-B-12A-B	6/17/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-12A	SB-B-12A-C	6/17/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-13	SB-B-13-A	7/8/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B-13	SB-B-13-B	7/8/2015	2 - 4.3	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-5	SB-B-5-A	6/24/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
B-5	SB-B-5-B	6/24/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-5	SB-B-5-C	6/24/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-6	SB-B-6-A	6/25/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
B-6	SB-B-6-B	6/25/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-6	SB-B-6-C	6/25/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-7	SB-B-7-A	6/26/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
B-7	SB-B-7-B	6/26/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-7	SB-B-7-C	6/26/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
B-8	SB-B-8-A	6/29/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
B-9A	SB-B-9A-A	7/6/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
B-9B	SB-B-9B-A	6/16/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B-9B	SB-B-9B-B	6/16/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
B-9B	SB-B-9B-C	6/16/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-10	SB-C-10-A	6/15/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-10	SB-C-10-B	6/15/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-10	SB-C-10-C	6/15/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-11	SB-C-11-A	6/15/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-11	SB-C-11-B	6/15/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes

TABLE A-1

SOIL SAMPLE LIST

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Location	Sample ID	Sample Date	Sample Depth (feet)	Surface Soil			Subsurface Soil	Analysis			
				Under Pavement?	Current Land Use	Future Land Use		VOC	SVOC Pesticides	Pesticides	Metal
C-11	SB-C-11-C	6/15/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-12	SB-C-12-A	6/26/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-12	SB-C-12-B	6/26/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-12	SB-C-12-C	6/26/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-14A	SB-C-14A-A	7/8/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-14A	SB-C-14A-B	7/8/2015	2 - 4.3	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-14B	SB-C-14B-A	7/8/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-14B	SB-C-14B-B	7/8/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-15	SB-C-15-A	7/7/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C-15	SB-C-15-B	7/7/2015	2 - 5	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-4	SB-C-4-A	6/24/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
C-4	SB-C-4-B	6/24/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-4	SB-C-4-C	6/24/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-5	SB-C-5-A	6/26/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
C-5	SB-C-5-B	6/26/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-5	SB-C-5-C	6/26/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-6	SB-C-6-A	6/26/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
C-6	SB-C-6-B	6/26/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-6	SB-C-6-C	6/26/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-7	SB-C-7-A	6/29/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
C-7	SB-C-7-B	6/29/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-7	SB-C-7-C	6/29/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-8	SB-C-8-A	7/1/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
C-8	SB-C-8-B	7/1/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
C-8	SB-C-8-C	7/1/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-9	SB-C-9-A	7/7/2015	0 - 2	No	Yes	Yes	Yes	Yes	No	No	No
C-9	SB-C-9-B	7/7/2015	2 - 6	NA	NA	NA	Yes	Yes	No	No	No
C-9	SB-C-9-C	7/9/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
C-9	SB-C-9-A-R	7/9/2015	0 - 2	No	Yes	Yes	Yes	No	Yes	Yes	Yes
C-9	SB-C-9-B-R	7/9/2015	2 - 6	NA	NA	NA	Yes	No	Yes	Yes	Yes
CC-11	SB-CC-11-A	6/25/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CC-11	SB-CC-11-B	6/25/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
CC-11	SB-CC-11-C	6/25/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
CC-2	SB-CC-2-A	6/23/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
CC-2	SB-CC-2-B	6/23/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
CC-2	SB-CC-2-C	6/23/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
CC-6	SB-CC-6-A	6/24/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CC-6	SB-CC-6-B	6/24/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
CC-6	SB-CC-6-C	6/24/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
CC-7	SB-CC-7-A	6/24/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CC-7	SB-CC-7-B	6/24/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
CC-7	SB-CC-7-C	6/24/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
CC-8	SB-CC-8-A	6/25/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CC-8	SB-CC-8-B	6/25/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
CC-8	SB-CC-8-C	6/25/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-1	SB-D-1-A	6/30/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-1	SB-D-1-B	6/30/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-1	SB-D-1-C	6/30/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-10	SB-D-10-A	6/15/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-10	SB-D-10-B	6/15/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-10	SB-D-10-C	6/15/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-11	SB-D-11-A	6/15/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-11	SB-D-11-B	6/16/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-11	SB-D-11-C	6/16/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-12	SB-D-12-A	6/25/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-12	SB-D-12-B	6/25/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-12	SB-D-12-C	6/25/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-13A	SB-D-13A-A	6/29/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-13A	SB-D-13A-B	6/29/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-13A	SB-D-13A-C	6/29/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-13B	SB-D-13B-A	7/7/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-13B	SB-D-13B-B	7/7/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-13B	SB-D-13B-C	7/7/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-14	SB-D-14-A	7/8/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-14	SB-D-14-B	7/8/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes

TABLE A-1

SOIL SAMPLE LIST

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Location	Sample ID	Sample Date	Sample Depth (feet)	Surface Soil			Subsurface Soil	Analysis			
				Under Pavement?	Current Land Use	Future Land Use		VOC	SVOC Pesticides	Pesticides	Metal
D-15	SB-D-15-A	7/7/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D-15	SB-D-15-B	7/7/2015	2 - 5.5	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-4	SB-D-4-A	7/6/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
D-4	SB-D-4-B	7/6/2015	2 - 5.5	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-5	SB-D-5-A	6/30/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
D-5	SB-D-5-B	6/30/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-5	SB-D-5-C	6/30/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-6	SB-D-6-A	7/1/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
D-6	SB-D-6-B	7/1/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-6	SB-D-6-C	7/1/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-7	SB-D-7-A	6/30/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
D-7	SB-D-7-B	6/30/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-7	SB-D-7-C	6/30/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-8	SB-D-8-A	7/6/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
D-8	SB-D-8-B	7/6/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-8	SB-D-8-C	7/6/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
D-9	SB-D-9-A	7/1/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
D-9	SB-D-9-B	7/1/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
D-9	SB-D-9-C	7/1/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-10	SB-E-10-A	6/16/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-10	SB-E-10-B	6/16/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-10	SB-E-10-C	6/16/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-11	SB-E-11-A	6/26/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-11	SB-E-11-B	6/26/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-11	SB-E-11-C	6/26/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-12	SB-E-12-A	6/29/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-12	SB-E-12-B	6/29/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-12	SB-E-12-C	6/29/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-13	SB-E-13-A	6/29/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-13	SB-E-13-B	6/29/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-13	SB-E-13-C	6/29/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-14	SB-E-14-A	7/7/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-14	SB-E-14-B	7/7/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-15	SB-E-15-A	7/7/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-15	SB-E-15-B	7/7/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-3	SB-E-3-A	6/30/2015	0 - 2	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
E-3	SB-E-3-B	6/30/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-3	SB-E-3-C	6/30/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-4	SB-E-4-A	6/30/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-4	SB-E-4-B	6/30/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-4	SB-E-4-C	6/30/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-5	SB-E-5-A	6/30/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-5	SB-E-5-B	6/30/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-5	SB-E-5-C	6/30/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-6	SB-E-6-A	6/18/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-6	SB-E-6-B	6/18/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-6	SB-E-6-C	6/18/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-7	SB-E-7-A	6/17/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-7	SB-E-7-B	6/17/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-7	SB-E-7-C	6/17/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-8	SB-E-8-A	6/17/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-8	SB-E-8-B	6/17/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-8	SB-E-8-C	6/17/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
E-9	SB-E-9-A	6/17/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
E-9	SB-E-9-B	6/17/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
E-9	SB-E-9-C	6/17/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-10	SB-F-10-A	6/19/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-10	SB-F-10-B	6/19/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-10	SB-F-10-C	6/19/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-11	SB-F-11-A	7/1/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-11	SB-F-11-B	7/1/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-11	SB-F-11-C	7/1/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-12	SB-F-12-A	7/1/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-12	SB-F-12-B	7/1/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-12	SB-F-12-C	7/1/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes

TABLE A-1

SOIL SAMPLE LIST

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Location	Sample ID	Sample Date	Sample Depth (feet)	Surface Soil			Subsurface Soil	Analysis			
				Under Pavement?	Current Land Use	Future Land Use		VOC	SVOC Pesticides	Pesticides	Metal
F-13	SB-F-13-A	7/6/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-13	SB-F-13-B	7/6/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-13	SB-F-13-C	7/6/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-5	SB-F-5-A	7/6/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-5	SB-F-5-B	7/6/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-5	SB-F-5-C	7/6/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-6	SB-F-6-A	7/6/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-6	SB-F-6-B	7/6/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-6	SB-F-6-C	7/6/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-7	SB-F-7-A	6/19/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-7	SB-F-7-B	6/19/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-7	SB-F-7-C	6/19/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-8	SB-F-8-A	6/18/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-8	SB-F-8-B	6/18/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-8	SB-F-8-C	6/18/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes
F-9	SB-F-9-A	6/18/2015	0 - 2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-9	SB-F-9-B	6/18/2015	2 - 6	NA	NA	NA	Yes	Yes	Yes	Yes	Yes
F-9	SB-F-9-C	6/18/2015	6 - 10	NA	NA	NA	Yes	Yes	Yes	No	Yes

Appendix B

RAGS D Tables – RME Scenario

Table B-1	Selection of Exposure Pathways
Table B-2	Occurrence, Distribution and Selection of Chemicals of Potential Concern
B-2.1.1	Current Surface Soil
B-2.1.2	Future Surface Soil
B-2.2	Future Surface/Subsurface Soil
Table B-3	Medium-Specific Exposure Point Concentration Summary
B-3.1.1	Current Surface Soil
B-3.1.2	Future Surface Soil
B-3.2	Future Surface/Subsurface Soil
Table B-4	Values and Equations Used for Intake Calculations
B-4.1a	Equations Used for Daily Intake Calculations for Soil Exposure Pathways
B-4.1b	Values Used for Daily Intake Calculations for Soil Exposure Pathways
B-4.2	Chemical-Specific Information Used for Daily Intake Calculations
Table B-5	Noncancer Toxicity Data
B-5.1	Oral/Dermal
B-5.2a	Inhalation (Chronic)
B-5.2b	Inhalation (Acute)
Table B-6	Cancer Toxicity Data
B-6.1	Oral/Dermal
B-6.2	Inhalation
Table B-7	Calculation of Chemical Cancer Risks and Noncancer Hazards - Reasonable Maximum Exposure
B-7.1	Current Worker
B-7.2	Current Trespasser (Adult)
B-7.3	Future Worker
B-7.4	Future Trespasser (Adult)
B-7.5	Current/Future Construction/Utility Worker
Table B-8	Calculation of Radiation Cancer Risks - NOT APPLICABLE TO THIS SITE

Table B-9 Summary of Receptor Risks and Hazards for Chemical of Potential Concerns - Reasonable Maximum Exposure

- B-9.1 Current Worker
- B-9.2 Current Trespasser (Adult)
- B-9.3 Future Worker
- B-9.4 Future Trespasser (Adult)
- B-9.5 Current/Future Construction/Utility Worker

Table B-10 Risk Assessment Summary - Reasonable Maximum Exposure

- B-10.1 Current Worker
- B-10.2 Current Trespasser (Adult)
- B-10.3 Future Worker
- B-10.4 Future Trespasser (Adult)
- B-10.5 Current/Future Construction/Utility Worker

TABLE B-1
SELECTION OF EXPOSURE PATHWAYS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor (Age)	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway	
Current and Future	Soil	Surface Soil	The Site (21, 25, and 30 Sherwood Lane and JCMUA)	On-site Worker	Adult	Dermal	Quant	Workers may come into contact with contaminants in surface soil and/or inhale fugitive dust and volatile chemicals while working at the site.	
						Ingestion	Quant		
						Inhalation	Quant		
			The Site (21, 25, and 30 Sherwood Lane and JCMUA)	Trespasser	Adult	Dermal	Quant		Trespassers may come into contact with contaminants in surface soil and/or inhale fugitive dust and volatile chemicals while visiting the site.
						Ingestion	Quant		
						Inhalation	Quant		
		Indoor Air	25 Sherwood Lane ⁽¹⁾	On-site Worker	Adult	Inhalation	Qual	Workers may be exposed to contaminants in indoor air via vapor intrusion pathway. Indoor air concentrations are screened against the Vapor Intrusion Screening Levels in the risk assessment.	
		Surface and Subsurface Soil	The Site (21, 25, and 30 Sherwood Lane and JCMUA)	Construction/Utility Worker	Adult	Dermal	Quant	Construction workers may come into contact with contaminants in soil and/or inhale fugitive dust and volatile chemicals while working at the site.	
						Ingestion	Quant		
						Inhalation	Quant		

Note:

Quant = Quantitative risk analysis performed

Qual = Qualitative risk analysis performed

JCMUA = Jersey City Municipal Utilities Authority

⁽¹⁾ Polychlorinated biphenyls Aroclors data provided in EPA/Weston Removal Assessment Investigation report, dated February 2013, are used for indoor air screening evaluation

**TABLE B-2.1.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface Soil

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾
Surface Soil	Volatile Organic Compounds														
	87-61-6	1,2,3-Trichlorobenzene	1.5 J	3.1 J	µg/kg	E-10	2 / 48	2.9 - 14	3.1	NA	93000 n	NA	NRDCSCC	No	IFD
	120-82-1	1,2,4-Trichlorobenzene	3.2 J+	9.3	µg/kg	E-6	4 / 48	2.9 - 14	9.3	NA	26000 n	1200000	NRDCSCC	No	BSL
	541-73-1	1,3-Dichlorobenzene	3.6 J+	3.6 J+	µg/kg	E-11	1 / 48	2.9 - 14	3.6	NA	NA	10000000	NRDCSCC	No	IFD
	106-46-7	1,4-Dichlorobenzene	9.2 J+	9.2 J+	µg/kg	E-11	1 / 48	2.9 - 14	9.2	NA	11000 c	10000000	NRDCSCC	No	IFD
	78-93-3	2-Butanone	6.7 J	24	µg/kg	E-14	4 / 48	5.7 - 27	24	NA	19000000 n	1000000	NRDCSCC	No	BSL
	591-78-6	2-Hexanone	9.1 J	9.1 J	µg/kg	F-12	1 / 48	5.7 - 27	9.1	NA	130000 n	NA	NRDCSCC	No	IFD
	67-64-1	Acetone	13	4700	µg/kg	E-13	11 / 48	6.2 - 850	4700	NA	56000000 ns	1000000	NRDCSCC	No	BSL
	75-15-0	Carbon Disulfide	1 J	1.7 J	µg/kg	E-11	2 / 48	2.9 - 14	1.7	NA	350000 n	NA	NRDCSCC	No	IFD
	156-59-2	cis-1,2-Dichloroethene	4.4 J	4.4 J	µg/kg	F-10	1 / 48	2.9 - 14	4.4	NA	230000 n	1000000	NRDCSCC	No	IFD
	110-82-7	Cyclohexane	0.52 J	0.52 J	µg/kg	B-10	1 / 48	2.9 - 14	0.52	NA	120000 ns	NA	NRDCSCC	No	IFD
	98-82-8	Isopropylbenzene	0.67 J	0.94 J	µg/kg	E-6	2 / 48	2.9 - 14	0.94	NA	260000 ns	NA	NRDCSCC	No	IFD
	100-42-5	Styrene	2.2 J	2.2 J	µg/kg	E-5	1 / 48	2.9 - 14	2.2	NA	840000 ns	97000	NRDCSCC	No	IFD
	127-18-4	Tetrachloroethene	6.6 J	6.6 J	µg/kg	B-9B	1 / 48	2.9 - 14	6.6	NA	39000 n	6000	NRDCSCC	No	IFD
	108-88-3	Toluene	1.2 J	7.9	µg/kg	E-12	2 / 48	2.9 - 14	7.9	NA	750000 ns	1000000	NRDCSCC	No	IFD
	79-01-6	Trichloroethene	0.71 J	3.3 J	µg/kg	B-11	8 / 48	2.9 - 14	3.3	NA	1900 n	54000	NRDCSCC	Yes	TOX
	Semi-volatile Organic Compounds														
	92-52-4	1,1'-Biphenyl	26 J	26 J	µg/kg	F-13	1 / 48	180 - 220	26	NA	20000 n	NA	NRDCSCC	No	IFD
	95-94-3	1,2,4,5-Tetrachlorobenzene	16 J	16 J	µg/kg	E-10	1 / 48	180 - 220	16	NA	35000 n	NA	NRDCSCC	No	IFD
	51-28-5	2,4-Dinitrophenol	390 J	390 J	µg/kg	D-1	1 / 48	340 - 430	390	NA	160000 n	2100000	NRDCSCC	No	IFD
	91-57-6	2-Methylnaphthalene	13 J	47 J	µg/kg	F-13	3 / 48	180 - 220	47	NA	300000 n	NA	NRDCSCC	No	BSL
	83-32-9	Acenaphthene	12 J	290	µg/kg	F-13	9 / 48	180 - 220	290	NA	4500000 n	10000000	NRDCSCC	No	BSL
	208-96-8	Acenaphthylene	37 J	96 J	µg/kg	CC-7	4 / 48	180 - 220	96	NA	4500000 n ⁽⁵⁾	10000000	NRDCSCC ⁽⁵⁾	No	BSL
	120-12-7	Anthracene	9.4 J	710	µg/kg	E-15	15 / 48	180 - 220	710	NA	23000000 n	10000000	NRDCSCC	No	BSL
	56-55-3	Benzo(a)anthracene	12 J-	2200 J+	µg/kg	CC-7	35 / 48	180 - 220	2200	NA	2900 c	4000	NRDCSCC	No	BSL
	50-32-8	Benzo(a)pyrene	9.3 J+	2400 J+	µg/kg	CC-7	36 / 48	180 - 220	2400	NA	290 c	660	NRDCSCC	Yes	ASL
	205-99-2	Benzo(b)fluoranthene	17 J	3500 J+	µg/kg	CC-7	42 / 48	180 - 220	3500	NA	2900 c	4000	NRDCSCC	Yes	ASL
	207-08-9	Benzo(k)fluoranthene	8.3 J+	1200 J+	µg/kg	CC-7	35 / 48	180 - 220	1200	NA	29000 c	4000	NRDCSCC	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	31 J	1900 J	µg/kg	D-13A	46 / 48	180 - 220	1900	NA	160000 c	210000	NRDCSCC	No	BSL
	85-68-7	Butylbenzylphthalate	15 J	42 J	µg/kg	CC-11	3 / 48	180 - 220	42	NA	1200000 c	10000000	NRDCSCC	No	BSL
	105-60-2	Caprolactam	27 J	600 J	µg/kg	E-15	6 / 48	340 - 430	600	NA	40000000 n	NA	NRDCSCC	No	BSL
	86-74-8	Carbazole	23 J	790	µg/kg	E-15	9 / 48	340 - 430	790	NA	NA	NA	NRDCSCC	No	NTX
	218-01-9	Chrysene	9.2 J	2200 J+	µg/kg	CC-7/E-15	37 / 48	180 - 220	2200	NA	290000 c	4000	NRDCSCC	No	BSL
	132-64-9	Dibenzofuran	25 J	180	µg/kg	F-13	5 / 48	180 - 220	180	NA	100000 n	NA	NRDCSCC	No	BSL
	84-74-2	Di-N-Butylphthalate	13 J	13 J	µg/kg	CC-11/B-13	2 / 48	180 - 220	13	NA	8200000 n	10000000	NRDCSCC	No	IFD
	117-84-0	Di-N-Octylphthalate	42 J	42 J	µg/kg	A-11	1 / 48	340 - 430	42	NA	820000 n	10000000	NRDCSCC	No	IFD
	206-44-0	Fluoranthene	16 J+	5600 J+	µg/kg	E-15	35 / 48	340 - 430	5600	NA	3000000 n	10000000	NRDCSCC	No	BSL
	86-73-7	Fluorene	16 J	390	µg/kg	E-15/F-13	8 / 48	180 - 220	390	NA	3000000 n	10000000	NRDCSCC	No	BSL
	91-20-3	Naphthalene	11 J	29 J	µg/kg	F-13	4 / 48	180 - 220	29	NA	17000 c	4200000	NRDCSCC	No	BSL
	85-01-8	Phenanthrene	11 J	5200 J	µg/kg	E-15	31 / 48	180 - 220	5200	NA	23000000 n ⁽⁶⁾	10000000	NRDCSCC ⁽⁶⁾	No	BSL
	129-00-0	Pyrene	9.1 J	9800 J+	µg/kg	E-15	43 / 48	180 - 220	9800	NA	2300000 n	10000000	NRDCSCC	No	BSL

**TABLE B-2.1.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface Soil

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾
Surface Soil (continued)	Pesticides/Polychlorinated Biphenyls														
	72-54-8	4,4'-DDD	3.6 NJ	47 JN	µg/kg	D-15	9 / 48	3.4 - 360	47	NA	9600 c	12000	NRDCSCC	No	BSL
	72-55-9	4,4'-DDE	2.1 J	8600 J	µg/kg	E-10	42 / 48	3.5 - 3600	8600	NA	9300 c	9000	NRDCSCC	No	BSL
	50-29-3	4,4'-DDT	2.2 J	7200	µg/kg	E-10	28 / 48	3.4 - 3600	7200	NA	8500 c	9000	NRDCSCC	No	BSL
	309-00-2	Aldrin	1.1 J	21000 J	µg/kg	E-10	31 / 48	1.8 - 1900	21000	NA	180 c	170	NRDCSCC	Yes	ASL
	5103-71-9	Alpha-Chlordane	0.81 J+	4200 J	µg/kg	E-8	10 / 48	1.8 - 1800	4200	NA	7500 c ⁽⁷⁾	NA	NRDCSCC	No	BSL
	12672-29-6	Aroclor 1248	110	2300000	µg/kg	E-10	44 / 48	35 - 360000	2300000	NA	950 c	2000	NRDCSCC⁽⁸⁾	Yes	ASL
	11097-69-1	Aroclor 1254	36 J	5600	µg/kg	D-15	11 / 48	35 - 36000	5600	NA	970 c	2000	NRDCSCC⁽⁸⁾	Yes	ASL
	319-86-8	Delta-BHC	1.8 NJ	1200 J	µg/kg	E-5/E-11	25 / 48	1.7 - 1300	1200	NA	1300 c ⁽⁹⁾	NA	NRDCSCC	No	BSL
	60-57-1	Dieldrin	5.4 J	20000	µg/kg	E-10	42 / 48	3.5 - 3600	20000	NA	140 c	180	NRDCSCC	Yes	ASL
	959-98-8	Endosulfan I	0.51 J	1500 J	µg/kg	E-10	23 / 48	1.7 - 500	1500	NA	70000 n ⁽¹⁰⁾	6200000	NRDCSCC ⁽¹⁰⁾	No	BSL
	33213-65-9	Endosulfan II	0.57 J	25 JN	µg/kg	D-13B	11 / 48	3.4 - 360	25	NA	70000 n ⁽¹⁰⁾	6200000	NRDCSCC ⁽¹⁰⁾	No	BSL
	1031-07-8	Endosulfan Sulfate	0.28 J	0.28 J	µg/kg	D-1	1 / 48	3.4 - 360	0.28	NA	70000 n ⁽¹⁰⁾	6200000	NRDCSCC ⁽¹⁰⁾	No	IFD
	72-20-8	Endrin	0.62 J	2000 J	µg/kg	E-10	39 / 48	3.4 - 360	2000	NA	25000 n	310000	NRDCSCC	No	BSL
	7421-93-4	Endrin Aldehyde	1.8 J	790 JN	µg/kg	E-10	18 / 48	3.4 - 360	790	NA	25000 n ⁽¹¹⁾	310000	NRDCSCC ⁽¹¹⁾	No	BSL
	53494-70-5	Endrin Ketone	3.6 NJ	240 J	µg/kg	E-8	7 / 48	3.4 - 360	240	NA	25000 n ⁽¹¹⁾	310000	NRDCSCC ⁽¹¹⁾	No	BSL
	58-89-9	Gamma-BHC (Lindane)	0.31 J	400 JN	µg/kg	E-11	29 / 48	1.7 - 1600	400	NA	2500 c	2200	NRDCSCC	No	BSL
	5103-74-2	Gamma-Chlordane	0.82 J	9300 J	µg/kg	E-10	43 / 48	1.8 - 1900	9300	NA	7500 c⁽⁷⁾	NA	NRDCSCC	Yes	ASL
	76-44-8	Heptachlor	16 J	19000 JN	µg/kg	E-10	21 / 48	1.8 - 1900	19000	NA	630 c	650	NRDCSCC	Yes	ASL
	1024-57-3	Heptachlor Epoxide	0.73 J	2900	µg/kg	E-5	11 / 48	1.8 - 2700	2900	NA	330 c	NA	NRDCSCC	Yes	ASL
	72-43-5	Methoxychlor	1.1 J	5 J	µg/kg	C-9	2 / 48	17 - 1900	5	NA	410000 n	5200000	NRDCSCC	No	IFD
	Inorganics														
	7429-90-5	Aluminum	5540 J	26500	mg/kg	D-13B	48 / 48	15.4 - 210	26500	NA	100000 nm	NA	NRDCSCC	No	BSL
	7440-36-0	Antimony	0.38	0.71	mg/kg	D-13B	3 / 48	0.21 - 1.5	0.71	NA	47 n	340	NRDCSCC	No	BSL
	7440-38-2	Arsenic	0.73 J	11.4	mg/kg	F-11	46 / 48	0.52 - 3	11.4	NA	3 c	20	NRDCSCC	Yes	TOX
	7440-39-3	Barium	15.6 J	101	mg/kg	C-14A	48 / 48	5.2 - 30.2	101	NA	22000 n	47000	NRDCSCC	No	BSL
	7440-41-7	Beryllium	0.18 J	0.93 J	mg/kg	C-14A	34 / 48	0.44 - 3	0.93	NA	230 n	2	NRDCSCC	No	BSL
	7440-43-9	Cadmium	0.051 J	4.1	mg/kg	B-9B	25 / 48	0.44 - 3	4.1	NA	98 n	100	NRDCSCC	No	BSL
	7440-70-2	Calcium	1200	28700	mg/kg	F-9	48 / 48	385 - 5240	28700	NA	NA	NA	NRDCSCC	No	NUT
	7440-47-3	Chromium	8.6	690	mg/kg	D-13A	48 / 48	1 - 109	690	NA	6.3 c⁽¹²⁾	6100	NRDCSCC	Yes	ASL
	7440-48-4	Cobalt	3.5	19	mg/kg	E-13	48 / 48	0.52 - 3	19	NA	35 n	NA	NRDCSCC	No	BSL
	7440-50-8	Copper	2.3	1100	mg/kg	D-13B	48 / 48	0.98 - 109	1100	NA	4700 n	600	NRDCSCC	No	BSL
	7439-89-6	Iron	13900	57100	mg/kg	F-9	48 / 48	10.1 - 524	57100	NA	82000 n	NA	NRDCSCC	No	BSL
	7439-92-1	Lead	3.2	130	mg/kg	C-9	48 / 48	0.52 - 53.6	130	NA	800 ⁽¹³⁾	600	NRDCSCC	No	BSL
	7439-95-4	Magnesium	1040	12200	mg/kg	E-13	48 / 48	385 - 5240	12200	NA	NA	NA	NRDCSCC	No	NUT
	7439-96-5	Manganese	94.5	24800	mg/kg	E-5	47 / 48	0.52 - 60.3	24800	NA	2600 n	NA	NRDCSCC	Yes	ASL
	7439-97-6	Mercury	0.0026 J	0.15	mg/kg	CC-8/C-15	39 / 48	0.046 - 0.11	0.15	NA	35 n ⁽¹⁴⁾	270	NRDCSCC	No	BSL
	7440-02-0	Nickel	5.2	70.7	mg/kg	D-13A	48 / 48	0.52 - 3	70.7	NA	2200 n ⁽¹⁵⁾	2400	NRDCSCC	No	BSL
	7440-09-7	Potassium	597	3130	mg/kg	C-14A	45 / 48	385 - 5240	3130	NA	NA	NA	NRDCSCC	No	NUT
	7782-49-2	Selenium	0.21 J	1.5	mg/kg	F-6/F-12	35 / 48	0.41 - 2.8	1.5	NA	580 n	3100	NRDCSCC	No	BSL
	7440-22-4	Silver	0.0057 J	0.64	mg/kg	D-13B	13 / 48	0.44 - 3	0.64	NA	580 n	4100	NRDCSCC	No	BSL

**TABLE B-2.1.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface Soil

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾
Surface Soil (continued)	7440-23-5	Sodium	577	1850	mg/kg	F-13	14 / 48	385 - 5070	1850	NA	NA	NA	NRDCSCC	No	NUT
	7440-62-2	Vanadium	13.5	149	mg/kg	D-13A	47 / 48	2.6 - 15.1	149	NA	580 n ⁽¹⁶⁾	7100	NRDCSCC	No	BSL
	7440-66-6	Zinc	5.4	721	mg/kg	D-13B	46 / 48	1 - 115	721	NA	35000 n	1500	NRDCSCC	No	BSL

⁽¹⁾ Maximum detected concentration used for screening

⁽²⁾ Screened against Regional Screening Levels (RSL), November 2015, for industrial soil, adjusted to a cancer risk of 1x10⁻⁶ and hazard quotient of 0.1. <http://www.epa.gov/region09/waste/sfund/prg/index.html>. The screening level (SL) was adjusted for each chemical when the inhalation SL portion of the RSL exceeded the corresponding saturation concentration value.

⁽³⁾ Potential ARAR/TBC value from NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (May 1999)

⁽⁴⁾ Rationale Codes:

Selection Reason: ASL = above screening level
TOX = Group A carcinogen
Deletion Reason: BSL = below screening level
NUT = essential nutrient
NTX = no toxicity information available
IFD = detection frequency less than 5%

NA = not available

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

J+ = qualifier for estimated biased high value

JN = qualifier for estimated tentatively identified value

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

⁽⁵⁾ screening value for acenaphthene

⁽⁶⁾ screening value for anthracene

⁽⁷⁾ screening value for chlordane

⁽⁸⁾ screening value for polychlorinated biphenyl

⁽⁹⁾ screening value for hexachlorocyclohexane, technical

⁽¹⁰⁾ screening value for endosulfan

⁽¹¹⁾ screening value for endrin

⁽¹²⁾ screening value for chromium VI

⁽¹³⁾ Office of Solid Waste and Emergency Response (OSWER) screening value for industrial soil

⁽¹⁴⁾ screening value for mercuric chloride (and other mercury salts)

⁽¹⁵⁾ screening value for nickel soluble salts

⁽¹⁶⁾ screening value for chromium VI

**TABLE B-2.1.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

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

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾
Surface Soil	Volatile Organic Compounds														
	87-61-6	1,2,3-Trichlorobenzene	1.5 J	3.1 J	µg/kg	E-10	2 / 75	2.9 - 310	3.1	NA	93000 n	NA	NRDCSCC	No	IFD
	120-82-1	1,2,4-Trichlorobenzene	2.5 J	9.3	µg/kg	E-6	5 / 75	2.9 - 310	9.3	NA	26000 n	1200000	NRDCSCC	No	BSL
	541-73-1	1,3-Dichlorobenzene	3.6 J+	3.6 J+	µg/kg	E-11	1 / 75	2.9 - 310	3.6	NA	NA	10000000	NRDCSCC	No	IFD
	106-46-7	1,4-Dichlorobenzene	9.2 J+	9.2 J+	µg/kg	E-11	1 / 75	2.9 - 310	9.2	NA	11000 c	10000000	NRDCSCC	No	IFD
	78-93-3	2-Butanone	6.7 J	24	µg/kg	E-14	4 / 75	5.7 - 610	24	NA	1.9E+07 n	1000000	NRDCSCC	No	BSL
	591-78-6	2-Hexanone	9.1 J	9.1 J	µg/kg	F-12	1 / 75	5.7 - 610	9.1	NA	130000 n	NA	NRDCSCC	No	IFD
	67-64-1	Acetone	6.4 J	4700	µg/kg	E-13	18 / 75	6.2 - 850	4700	NA	5.6E+07 ns	1000000	NRDCSCC	No	BSL
	75-15-0	Carbon Disulfide	1 J	1.7 J	µg/kg	E-11	2 / 75	2.9 - 310	1.7	NA	350000 n	NA	NRDCSCC	No	IFD
	156-59-2	cis-1,2-Dichloroethene	4.4 J	4.4 J	µg/kg	F-10	1 / 75	2.9 - 310	4.4	NA	230000 n	1000000	NRDCSCC	No	IFD
	110-82-7	Cyclohexane	0.52 J	0.52 J	µg/kg	B-10	1 / 75	2.9 - 310	0.52	NA	120000 ns	NA	NRDCSCC	No	IFD
	98-82-8	Isopropylbenzene	0.67	0.94 J	µg/kg	E-6	2 / 75	2.9 - 310	0.94	NA	260000 ns	NA	NRDCSCC	No	IFD
	100-42-5	Styrene	2.2 J	2.2 J	µg/kg	E-5	1 / 75	2.9 - 310	2.2	NA	840000 ns	97000	NRDCSCC	No	IFD
	127-18-4	Tetrachloroethene	1.4 J	6.6 J	µg/kg	B-9B	2 / 75	2.9 - 310	6.6	NA	39000 n	6000	NRDCSCC	No	IFD
	108-88-3	Toluene	0.88 J	7.9	µg/kg	E-12	6 / 75	2.9 - 310	7.9	NA	750000 ns	1000000	NRDCSCC	No	BSL
	10061-02-6	trans-1,3-Dichloropropene	2.1 J	2.1 J	µg/kg	A-5	1 / 75	2.9 - 310	2.1	NA	8200 c ⁽⁵⁾	5000	NRDCSCC	No	IFD
	79-01-6	Trichloroethene	0.71 J	14 J	µg/kg	C-5	19 / 75	2.9 - 280	14	NA	1900 n	54000	NRDCSCC	Yes	TOX
	Semi-volatile Organic Compounds														
	92-52-4	1,1'-Biphenyl	26 J	26 J	µg/kg	F-13	1 / 75	170 - 220	26	NA	20000 n	NA	NRDCSCC	No	IFD
	95-94-3	1,2,4,5-Tetrachlorobenzene	16 J	16 J	µg/kg	E-10	1 / 75	170 - 220	16	NA	35000 n	NA	NRDCSCC	No	IFD
	51-28-5	2,4-Dinitrophenol	340 J	390 J	µg/kg	D-1	3 / 75	330 - 430	390	NA	160000 n	2100000	NRDCSCC	No	IFD
	91-57-6	2-Methylnaphthalene	13 J	47 J	µg/kg	F-13	3 / 75	170 - 220	47	NA	300000 n	NA	NRDCSCC	No	IFD
	83-32-9	Acenaphthene	12 J	290	µg/kg	F-13	9 / 75	170 - 220	290	NA	4500000 n	10000000	NRDCSCC	No	BSL
	208-96-8	Acenaphthylene	14 J	96 J	µg/kg	CC-7	5 / 75	170 - 220	96	NA	4500000 n ⁽⁶⁾	10000000	NRDCSCC ⁽⁶⁾	No	BSL
	120-12-7	Anthracene	9.4 J	710	µg/kg	E-15	17 / 75	170 - 220	710	NA	2.3E+07 n	10000000	NRDCSCC	No	BSL
	56-55-3	Benzo(a)anthracene	10 J	2200 J+	µg/kg	CC-7	43 / 75	170 - 220	2200	NA	2900 c	4000	NRDCSCC	No	BSL
	50-32-8	Benzo(a)pyrene	9.3 J+	2400 J+	µg/kg	CC-7	41 / 75	170 - 220	2400	NA	290 c	660	NRDCSCC	Yes	ASL
	205-99-2	Benzo(b)fluoranthene	10 J	3500 J+	µg/kg	CC-7	52 / 75	170 - 220	3500	NA	2900 c	4000	NRDCSCC	Yes	ASL
	207-08-9	Benzo(k)fluoranthene	8.3 J+	1200 J+	µg/kg	CC-7	40 / 75	170 - 220	1200	NA	29000 c	4000	NRDCSCC	No	BSL
	117-81-7	Bis(2-Ethylhexyl)Phthalate	21 J	2300 J-	µg/kg	B-8	66 / 75	170 - 220	2300	NA	160000 c	210000	NRDCSCC	No	BSL
	85-68-7	Butylbenzylphthalate	15 J	42 J	µg/kg	CC-11	3 / 75	170 - 220	42	NA	1200000 c	10000000	NRDCSCC	No	IFD
	105-60-2	Caprolactam	25 J	600 J	µg/kg	E-15	8 / 75	330 - 430	600	NA	4E+07 n	NA	NRDCSCC	No	BSL
	86-74-8	Carbazole	23 J	790	µg/kg	E-15	9 / 75	330 - 430	790	NA	NA	NA	NRDCSCC	No	NTX
	218-01-9	Chrysene	9.2 J	2200 J+	µg/kg	CC-7/E-15	44 / 75	170 - 220	2200	NA	290000 c	40000	NRDCSCC	No	BSL
	132-64-9	Dibenzofuran	25 J	180	µg/kg	F-13	5 / 75	170 - 220	180	NA	100000 n	NA	NRDCSCC	No	BSL
	84-74-2	Di-N-Butylphthalate	13 J	13 J	µg/kg	CC-11/B-13	2 / 75	170 - 220	13	NA	8200000 n	10000000	NRDCSCC	No	IFD
	117-84-0	Di-N-Octylphthalate	42 J	42 J	µg/kg	A-11	1 / 75	330 - 430	42	NA	820000 n	10000000	NRDCSCC	No	IFD
	206-44-0	Fluoranthene	11 J	5600 J+	µg/kg	E-15	49 / 75	330 - 430	5600	NA	3000000 n	10000000	NRDCSCC	No	BSL
	86-73-7	Fluorene	16 J	390	µg/kg	E-15/F-13	8 / 75	170 - 220	390	NA	3000000 n	10000000	NRDCSCC	No	BSL
	91-20-3	Naphthalene	11 J	29 J	µg/kg	F-13	4 / 75	170 - 220	29	NA	17000 c	4200000	NRDCSCC	No	BSL
	85-01-8	Phenanthrene	10 J	5200 J	µg/kg	E-15	40 / 75	170 - 220	5200	NA	2.3E+07 n ⁽⁷⁾	10000000	NRDCSCC ⁽⁷⁾	No	BSL
	108-95-2	Phenol	19 J	19 J	µg/kg	B-8	1 / 75	330 - 430	19	NA	2.5E+07 n	10000000	NRDCSCC	No	IFD
	129-00-0	Pyrene	9.1 J	9800 J+	µg/kg	E-15	59 / 75	170 - 220	9800	NA	2300000 n	10000000	NRDCSCC	No	BSL

**TABLE B-2.1.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

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

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾	
Surface Soil (continued)	Pesticides/Polychlorinated Biphenyls															
	72-54-8	4,4'-DDD	0.6 J	47 JN	µg/kg	D-15	13 / 75	3.3 - 360	47	NA	9600 c	12000	NRDCSCC	No	BSL	
	72-55-9	4,4'-DDE	2.1 J	8600 J	µg/kg	E-10	63 / 75	3.3 - 3600	8600	NA	9300 c	9000	NRDCSCC	No	BSL	
	50-29-3	4,4'-DDT	0.15 J	7200	µg/kg	E-10	38 / 75	3.3 - 3600	7200	NA	8500 c	9000	NRDCSCC	No	BSL	
	309-00-2	Aldrin	1.1 J	21000 J	µg/kg	E-10	48 / 75	1.7 - 1900	21000	NA	180 c	170	NRDCSCC	Yes	ASL	
	319-84-6	Alpha-BHC	0.71 J	0.71 J	µg/kg	A-6	1 / 75	1.7 - 190	0.71	NA	360 c	NA	NRDCSCC	No	IFD	
	5103-71-9	Alpha-Chlordane	0.81 J+	4200 J	µg/kg	E-8	14 / 75	1.7 - 1800	4200	NA	7500 c ⁽⁶⁾	NA	NRDCSCC	No	BSL	
	12672-29-6	Aroclor 1248	110	2300000	µg/kg	E-10	68 / 75	35 - 360000	2300000	NA	950 c	2000	NRDCSCC⁽⁹⁾	Yes	ASL	
	11097-69-1	Aroclor 1254	36 J	5600	µg/kg	D-15	12 / 75	33 - 36000	5600	NA	970 c	2000	NRDCSCC⁽⁹⁾	Yes	ASL	
	11096-82-5	Aroclor 1260	68 J	68 J	µg/kg	C-7	1 / 75	33 - 36000	68	NA	990 c	2000	NRDCSCC	No	IFD	
	319-86-8	Delta-BHC	0.46 J	1400 NJ	µg/kg	D-6	41 / 75	1.7 - 1300	1400	NA	1300 c⁽¹⁰⁾	NA	NRDCSCC	Yes	ASL	
	60-57-1	Dieldrin	0.36 J	20000	µg/kg	E-10	65 / 75	3.3 - 3600	20000	NA	140 c	180	NRDCSCC	Yes	ASL	
	959-98-8	Endosulfan I	0.071 J	1500 J	µg/kg	E-10	40 / 75	1.7 - 500	1500	NA	70000 n ⁽¹¹⁾	6200000	NRDCSCC ⁽¹¹⁾	No	BSL	
	33213-65-9	Endosulfan II	0.57 J	58 NJ	µg/kg	C-8	20 / 75	3.3 - 360	58	NA	70000 n ⁽¹¹⁾	6200000	NRDCSCC ⁽¹¹⁾	No	BSL	
	1031-07-8	Endosulfan Sulfate	0.015 J	0.28 J	µg/kg	D-1	2 / 75	3.3 - 360	0.28	NA	70000 n ⁽¹¹⁾	6200000	NRDCSCC ⁽¹¹⁾	No	IFD	
	72-20-8	Endrin	0.077 J	2000 J	µg/kg	E-10	58 / 75	3.3 - 360	2000	NA	25000 n	310000	NRDCSCC	No	BSL	
	7421-93-4	Endrin Aldehyde	0.51 J	790 JN	µg/kg	E-10	24 / 75	3.3 - 360	790	NA	25000 n ⁽¹²⁾	310000	NRDCSCC ⁽¹²⁾	No	BSL	
	53494-70-5	Endrin Ketone	0.78 J	240 J	µg/kg	E-8	8 / 75	3.3 - 360	240	NA	25000 n ⁽¹²⁾	310000	NRDCSCC ⁽¹²⁾	No	BSL	
	58-89-9	Gamma-BHC (Lindane)	0.03 J	400 JN	µg/kg	E-11	42 / 75	1.7 - 1600	400	NA	2500 c	2200	NRDCSCC	No	BSL	
	5103-74-2	Gamma-Chlordane	0.82 J	9300 J	µg/kg	E-10	66 / 75	1.7 - 1900	9300	NA	7500 c⁽⁶⁾	NA	NRDCSCC	Yes	ASL	
	76-44-8	Heptachlor	3.7	19000 JN	µg/kg	E-10	33 / 75	1.7 - 1900	19000	NA	630 c	650	NRDCSCC	Yes	ASL	
	1024-57-3	Heptachlor Epoxide	0.73 J	2900	µg/kg	E-5	13 / 75	1.7 - 2700	2900	NA	330 c	NA	NRDCSCC	Yes	ASL	
	72-43-5	Methoxychlor	0.46 J	5 J	µg/kg	C-9	4 / 75	17 - 1900	5	NA	410000 n	5200000	NRDCSCC	No	BSL	
	Inorganics															
	7429-90-5	Aluminum	5540 J	27200 J	mg/kg	D-7	75 / 75	15.4 - 219	27200	NA	100000 nm	NA	NRDCSCC	No	BSL	
	7440-36-0	Antimony	0.38	0.71	mg/kg	D-13B	4 / 75	0.21 - 1.5	0.71	NA	47 n	340	NRDCSCC	No	BSL	
	7440-38-2	Arsenic	0.69 J	11.4	mg/kg	F-11	67 / 75	0.51 - 3	11.4	NA	3 c	20	NRDCSCC	Yes	TOX	
	7440-39-3	Barium	15.6 J	101	mg/kg	C-14A	75 / 75	5.1 - 30.2	101	NA	22000 n	47000	NRDCSCC	No	BSL	
	7440-41-7	Beryllium	0.18 J	0.93 J	mg/kg	C-14A	43 / 75	0.44 - 5.5	0.93	NA	230 n	2	NRDCSCC	No	BSL	
	7440-43-9	Cadmium	0.051 J	4.1	mg/kg	B-9B	41 / 75	0.44 - 3	4.1	NA	98 n	100	NRDCSCC	No	BSL	
	7440-70-2	Calcium	1200	28700	mg/kg	F-9	75 / 75	385 - 5460	28700	NA	NA	NA	NRDCSCC	No	NUT	
	7440-47-3	Chromium	8.6	690	mg/kg	D-13A	75 / 75	1 - 109	690	NA	6.3 c⁽¹³⁾	6100	NRDCSCC	Yes	ASL	
	7440-48-4	Cobalt	3.5	19	mg/kg	E-13	75 / 75	0.51 - 5.5	19	NA	35 n	NA	NRDCSCC	No	BSL	
	7440-50-8	Copper	2.3	1100	mg/kg	D-13B	75 / 75	0.98 - 109	1100	NA	4700 n	600	NRDCSCC	No	BSL	
	7439-89-6	Iron	13800	57100	mg/kg	F-9	75 / 75	10.1 - 524	57100	NA	82000 n	NA	NRDCSCC	No	BSL	
	7439-92-1	Lead	3.2	181	mg/kg	C-8	75 / 75	0.51 - 53.6	181	NA	800 ⁽¹⁴⁾	600	NRDCSCC	No	BSL	
	7439-95-4	Magnesium	1040	15100 J	mg/kg	D-7	75 / 75	385 - 5460	15100	NA	NA	NA	NRDCSCC	No	NUT	
	7439-96-5	Manganese	94.5	24800	mg/kg	E-5	74 / 75	0.51 - 60.3	24800	NA	2600 n	NA	NRDCSCC	Yes	ASL	
	7439-97-6	Mercury	0.0026 J	0.15	mg/kg	CC-8/C-15	63 / 75	0.028 - 0.11	0.15	NA	35 n ⁽¹⁵⁾	270	NRDCSCC	No	BSL	
	7440-02-0	Nickel	5.2	70.7	mg/kg	D-13A	75 / 75	0.51 - 5.5	70.7	NA	2200 n ⁽¹⁶⁾	2400	NRDCSCC	No	BSL	
	7440-09-7	Potassium	588	4500	mg/kg	E-3	72 / 75	385 - 5460	4500	NA	NA	NA	NRDCSCC	No	NUT	
	7782-49-2	Selenium	0.17 J	1.5	mg/kg	F-6/F-12	48 / 75	0.41 - 2.9	1.5	NA	580 n	3100	NRDCSCC	No	BSL	
7440-22-4	Silver	0.0057 J	1.4 J	mg/kg	C-4	22 / 75	0.44 - 3	1.4	NA	580 n	4100	NRDCSCC	No	BSL		

**TABLE B-2.1.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

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

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾
Surface Soil (continued)	7440-23-5	Sodium	503	5460 J	mg/kg	B-5	26 / 75	385 - 5460	5460	NA	NA	NA	NRDCSCC	No	NUT
	7440-62-2	Vanadium	8.6 J	149	mg/kg	D-13A	74 / 75	2.6 - 272	149	NA	580 n ⁽¹⁷⁾	7100	NRDCSCC	No	BSL
	7440-66-6	Zinc	5.4	721	mg/kg	D-13B	73 / 75	1 - 115	721	NA	35000 n	1500	NRDCSCC	No	BSL

⁽¹⁾ Maximum detected concentration used for screening

⁽²⁾ Screened against Regional Screening Levels (RSL), November 2015, for industrial soil, adjusted to a cancer risk of 1x10⁻⁶ and hazard quotient of 0.1. <http://www.epa.gov/region09/waste/sfund/prg/index.html>. The screening level (SL) was adjusted for each chemical when the inhalation SL portion of the RSL exceeded the corresponding saturation concentration value.

⁽³⁾ Potential ARAR/TBC value from NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (May 1999)

⁽⁴⁾ Rationale Codes:

Selection Reason: ASL = above screening level
TOX = Group A carcinogen
Deletion Reason: BSL = below screening level
NUT = essential nutrient
NTX = no toxicity information available
IFD = detection frequency less than 5%

NA = not available

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

J+ = qualifier for estimated biased high value

JN = qualifier for estimated tentatively identified value

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

⁽⁵⁾ screening value for 1,3-dichloropropene

⁽⁶⁾ screening value for acenaphthene

⁽⁷⁾ screening value for anthracene

⁽⁸⁾ screening value for chlordane

⁽⁹⁾ screening value for polychlorinated biphenyl

⁽¹⁰⁾ screening value for hexachlorocyclohexane, technical

⁽¹¹⁾ screening value for endosulfan

⁽¹²⁾ screening value for endrin

⁽¹³⁾ screening value for chromium VI

⁽¹⁴⁾ Office of Solid Waste and Emergency Response (OSWER) screening value for residential soil

⁽¹⁵⁾ screening value for mercuric chloride (and other mercury salts)

⁽¹⁶⁾ screening value for nickel soluble salts

⁽¹⁷⁾ screening value for vanadium and compounds

TABLE B-2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Curret/Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾	
Surface/ Subsurface Soil	Volatile Organic Compounds															
	79-34-5	1,1,2,2-Tetrachloroethane	8.2	8.2	µg/kg	D-8	1 / 211	2.8 - 340	8.2	NA	2700 c	70000	NRDCSCC	No	IFD	
	87-61-6	1,2,3-Trichlorobenzene	1.5 J	6.8 J	µg/kg	D-11	3 / 211	2.8 - 340	6.8	NA	93000 n	NA	NRDCSCC	No	IFD	
	120-82-1	1,2,4-Trichlorobenzene	2.5 J	16 J	µg/kg	D-11	6 / 211	2.8 - 340	16	NA	26000 n	1200000	NRDCSCC	No	IFD	
	541-73-1	1,3-Dichlorobenzene	3.6 J+	3.6 J+	µg/kg	E-11	1 / 211	2.8 - 340	3.6	NA	NA	10000000	NRDCSCC	No	IFD	
	106-46-7	1,4-Dichlorobenzene	9.2 J+	9.2 J+	µg/kg	E-11	1 / 211	2.8 - 340	9.2	NA	11000 c	10000000	NRDCSCC	No	IFD	
	78-93-3	2-Butanone	6.7 J	63	µg/kg	D-13B	12 / 211	5.6 - 680	63	NA	19000000 n	1000000	NRDCSCC	No	BSL	
	591-78-6	2-Hexanone	5.9 J	33	µg/kg	F-6	6 / 211	5.6 - 680	33	NA	130000 n	NA	NRDCSCC	No	IFD	
	67-64-1	Acetone	3.6 J	4700	µg/kg	E-13	57 / 211	4.7 - 850	4700	NA	56000000 ns	1000000	NRDCSCC	No	BSL	
	75-15-0	Carbon Disulfide	0.91 J	12	µg/kg	D-13B	4 / 211	2.8 - 340	12	NA	350000 n	NA	NRDCSCC	No	IFD	
	67-66-3	Chloroform	12	12	µg/kg	D-13B	1 / 211	2.8 - 340	12	NA	1400 c	28000	NRDCSCC	No	IFD	
	156-59-2	cis-1,2-Dichloroethene	0.73 J	4.4 J	µg/kg	F-10	6 / 211	2.8 - 340	4.4	NA	230000 n	1000000	NRDCSCC	No	IFD	
	10061-01-5	cis-1,3-Dichloropropene	3.9 J	3.9 J	µg/kg	B-5	1 / 211	2.8 - 340	3.9	NA	8200 c ⁽⁵⁾	5000	NRDCSCC ⁽⁵⁾	No	IFD	
	110-82-7	Cyclohexane	0.52 J	1.8 J	µg/kg	B-5	3 / 211	2.8 - 340	1.8	NA	120000 ns	NA	NRDCSCC	No	IFD	
	98-82-8	Isopropylbenzene	0.67	18	µg/kg	B-9B	6 / 211	2.8 - 340	18	NA	260000 ns	NA	NRDCSCC	No	IFD	
	79-20-9	Methyl Acetate	9	9	µg/kg	D-13B	1 / 211	2.8 - 340	9	NA	1E+08 nm	NA	NRDCSCC	No	IFD	
	75-09-2	Methylene Chloride			µg/kg		0 / 211	2.8 - 340	0	NA	320000 n	210000	NRDCSCC	No	ND	
	100-42-5	Styrene	2.2 J	2.2 J	µg/kg	E-5	1 / 211	2.8 - 340	2.2	NA	840000 ns	97000	NRDCSCC	No	IFD	
	127-18-4	Tetrachloroethene	1.2 J	7.8	µg/kg	B-13	9 / 211	2.8 - 340	7.8	NA	39000 n	6000	NRDCSCC	No	IFD	
	108-88-3	Toluene	0.59 J	13	µg/kg	F-7	17 / 211	2.8 - 340	13	NA	750000 ns	1000000	NRDCSCC	No	BSL	
	10061-02-6	trans-1,3-Dichloropropene	2.1 J	2.8 J	µg/kg	B-5	2 / 211	2.8 - 340	2.8	NA	8200 c ⁽⁵⁾	5000	NRDCSCC ⁽⁵⁾	No	IFD	
	79-01-6	Trichloroethene	0.71 J	29	µg/kg	B-7	65 / 211	2.8 - 290	29	NA	1900 n	54000	NRDCSCC	Yes	TOX	
	75-69-4	Trichlorofluoromethane	3.3 J	3.3 J	µg/kg	D-10	1 / 211	2.8 - 340	3.3	NA	35000000 n	NA	NRDCSCC	No	IFD	
	Semi-volatile Organic Compounds															
	92-52-4	1,1'-Biphenyl	16 J	140 J	µg/kg	E-13	4 / 211	170 - 230	140	NA	20000 n	NA	NRDCSCC	No	IFD	
	95-94-3	1,2,4,5-Tetrachlorobenzene	16 J	48 J	µg/kg	D-11	3 / 211	170 - 230	48	NA	35000 n	NA	NRDCSCC	No	IFD	
	51-28-5	2,4-Dinitrophenol	340 J	390 J	µg/kg	D-1/E-3	5 / 211	330 - 450	390	NA	160000 n	2100000	NRDCSCC	No	IFD	
	91-57-6	2-Methylnaphthalene	13 J	170 J	µg/kg	CC-7	5 / 211	170 - 230	170	NA	300000 n	NA	NRDCSCC	No	IFD	
100-01-6	4-Nitroaniline	95 J	95 J	µg/kg	CC-7	1 / 211	330 - 450	95	NA	110000 c	NA	NRDCSCC	No	IFD		
83-32-9	Acenaphthene	11 J	820	µg/kg	CC-7	19 / 211	170 - 230	820	NA	4500000 n	10000000	NRDCSCC	No	BSL		
208-96-8	Acenaphthylene	14 J	320	µg/kg	CC-7	12 / 211	170 - 230	320	NA	4500000 n ⁽⁶⁾	10000000	NRDCSCC ⁽⁶⁾	No	BSL		
120-12-7	Anthracene	9.4 J	2400 J	µg/kg	CC-7	38 / 211	170 - 230	2400	NA	23000000 n	10000000	NRDCSCC	No	BSL		
56-55-3	Benzo(a)anthracene	9.5 J	9100 J+	µg/kg	CC-7	96 / 211	170 - 230	9100	NA	2900 c	4000	NRDCSCC	Yes	ASL		
50-32-8	Benzo(a)pyrene	9 J	8900 J+	µg/kg	CC-7	98 / 211	170 - 230	8900	NA	2900 c	660	NRDCSCC	Yes	ASL		
205-99-2	Benzo(b)fluoranthene	10 J	11000 J+	µg/kg	CC-7	119 / 211	170 - 230	11000	NA	2900 c	4000	NRDCSCC	Yes	ASL		
207-08-9	Benzo(k)fluoranthene	6.4 J	5100 J+	µg/kg	CC-7	86 / 211	170 - 230	5100	NA	29000 c	4000	NRDCSCC	No	BSL		
117-81-7	Bis(2-Ethylhexyl)Phthalate	15 J	3000 J	µg/kg	D-12	166 / 211	170 - 230	3000	NA	160000 c	210000	NRDCSCC	No	BSL		
85-68-7	Butylbenzylphthalate	14 J	62 J	µg/kg	F-7	9 / 211	170 - 230	62	NA	1200000 c	10000000	NRDCSCC	No	IFD		
105-60-2	Caprolactam	25 J	640	µg/kg	F-5	20 / 211	330 - 450	640	NA	40000000 n	NA	NRDCSCC	No	BSL		
86-74-8	Carbazole	21 J	1500	µg/kg	CC-7	19 / 211	330 - 450	1500	NA	NA	NA	NRDCSCC	No	NTX		
218-01-9	Chrysene	9.2 J	8700 J+	µg/kg	CC-7	98 / 211	170 - 230	8700	NA	290000 c	40000	NRDCSCC	No	BSL		
132-64-9	Dibenzofuran	9.6 J	620	µg/kg	CC-7	14 / 211	170 - 230	620	NA	100000 n	NA	NRDCSCC	No	BSL		
131-11-3	Dimethylphthalate	39 J	39 J	µg/kg	C-11	1 / 211	170 - 230	39	NA	NA	10000000	NRDCSCC	No	IFD		
84-74-2	Di-N-Butylphthalate	12 J	450 J	µg/kg	C-6	8 / 211	170 - 230	450	NA	8200000 n	10000000	NRDCSCC	No	IFD		
117-84-0	Di-N-Octylphthalate	18 J	42 J	µg/kg	A-11	3 / 211	330 - 450	42	NA	820000 n	10000000	NRDCSCC	No	IFD		
206-44-0	Fluoranthene	9.9 J	8300 J+	µg/kg	CC-7	117 / 211	330 - 450	8300	NA	3000000 n	10000000	NRDCSCC	No	BSL		

TABLE B-2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Curret/Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾	
Surface/ Subsurface Soil (continued)	86-73-7	Fluorene	11 J	1200	µg/kg	CC-7	18 / 211	170 - 230	1200	NA	3000000 n	10000000	NRDCSCC	No	BSL	
	118-74-1	Hexachlorobenzene	240	240	µg/kg	D-11	1 / 211	170 - 230	240	NA	5300 c	21000	NRDCSCC	No	IFD	
	78-59-1	Isophorone	11 J	11 J	µg/kg	C-14B	1 / 211	170 - 230	11	NA	2400000 c	10000000	NRDCSCC	No	IFD	
	91-20-3	Naphthalene	11 J	170 J	µg/kg	CC-7	8 / 211	170 - 230	170	NA	17000 c	4200000	NRDCSCC	No	IFD	
	85-01-8	Phenanthrene	9.2 J	6500 J	µg/kg	CC-7	88 / 211	170 - 230	6500	NA	23000000 n ⁽⁷⁾	10000000	NRDCSCC ⁽⁷⁾	No	BSL	
	108-95-2	Phenol	19 J	19 J	µg/kg	B-8	1 / 211	330 - 450	19	NA	25000000 n	10000000	NRDCSCC	No	IFD	
	129-00-0	Pyrene	9.1 J	25000 J+	µg/kg	CC-7	127 / 211	170 - 230	25000	NA	2300000 n	10000000	NRDCSCC	No	BSL	
	Pesticides/Polychlorinated Biphenyls															
		72-54-8	4,4'-DDD	0.11 J	47 JN	µg/kg	D-15	26 / 149	3.3 - 1900	47	NA	9600 c	12000	NRDCSCC	No	BSL
		72-55-9	4,4'-DDE	1.1 J	62000 J	µg/kg	C-8	102 / 149	3.3 - 19000	62000	NA	9300 c	9000	NRDCSCC	Yes	ASL
	50-29-3	4,4'-DDT	0.15 J	29000	µg/kg	C-8	70 / 149	1.5 - 3600	29000	NA	8500 c	9000	NRDCSCC	Yes	ASL	
	309-00-2	Aldrin	0.096 J	92000 J	µg/kg	C-8	80 / 149	1.7 - 9900	92000	NA	180 c	170	NRDCSCC	Yes	ASL	
	319-84-6	Alpha-BHC	0.71 J	0.71 J	µg/kg	A-6	1 / 149	1.7 - 990	0.71	NA	360 c	NA	NRDCSCC	No	IFD	
	5103-71-9	Alpha-Chlordane	0.087 J	20000	µg/kg	D-11	27 / 149	1.7 - 8500	20000	NA	7500 c ⁽⁸⁾	NA	NRDCSCC	Yes	ASL	
	12672-29-6	Aroclor 1248	3.3 J	7000000	µg/kg	C-8	178 / 211	34 - 8E+05	7000000	NA	950 c	2000	NRDCSCC ⁽⁹⁾	Yes	ASL	
	11097-69-1	Aroclor 1254	3.5 J	26000	µg/kg	D-13B	27 / 211	33 - 77000	26000	NA	970 c	2000	NRDCSCC ⁽⁹⁾	Yes	ASL	
	11096-82-5	Aroclor 1260	68 J	68 J	µg/kg	C-7	1 / 211	33 - 77000	68	NA	990 c	2000	NRDCSCC	No	IFD	
	319-86-8	Delta-BHC	0.34 J	1400 NJ	µg/kg	D-6	66 / 149	1.7 - 8900	1400	NA	1300 c ⁽¹⁰⁾	NA	NRDCSCC	Yes	ASL	
	60-57-1	Dieldrin	0.068 J	99000	µg/kg	C-8	117 / 149	3.3 - 19000	99000	NA	140 c	180	NRDCSCC	Yes	ASL	
	959-98-8	Endosulfan I	0.049 J	1500 J	µg/kg	E-10	66 / 149	1.7 - 7800	1500	NA	70000 n ⁽¹¹⁾	6200000	NRDCSCC ⁽¹¹⁾	No	BSL	
	33213-65-9	Endosulfan II	0.22 J	58 NJ	µg/kg	C-8	32 / 149	3.3 - 1900	58	NA	70000 n ⁽¹¹⁾	6200000	NRDCSCC ⁽¹¹⁾	No	BSL	
	1031-07-8	Endosulfan Sulfate	0.015 J	1.5 J	µg/kg	A-3	6 / 149	3.3 - 1900	1.5	NA	70000 n ⁽¹¹⁾	6200000	NRDCSCC ⁽¹¹⁾	No	IFD	
	72-20-8	Endrin	0.075 J	8600	µg/kg	C-8	101 / 149	3.3 - 1900	8600	NA	25000 n	310000	NRDCSCC	No	BSL	
	7421-93-4	Endrin Aldehyde	0.23 J	1000 J	µg/kg	D-11	35 / 149	3.3 - 1900	1000	NA	25000 n ⁽¹²⁾	310000	NRDCSCC ⁽¹²⁾	No	BSL	
	53494-70-5	Endrin Ketone	0.78 J	1700 J	µg/kg	D-11	14 / 149	3.3 - 1900	1700	NA	25000 n ⁽¹²⁾	310000	NRDCSCC ⁽¹²⁾	No	BSL	
	58-89-9	Gamma-BHC (Lindane)	0.03 J	1800 J	µg/kg	C-8	66 / 149	1.7 - 1600	1800	NA	2500 c	2200	NRDCSCC	No	BSL	
	5103-74-2	Gamma-Chlordane	0.082 J	43000	µg/kg	C-8	120 / 149	1.7 - 9900	43000	NA	7500 c ⁽⁸⁾	NA	NRDCSCC	Yes	ASL	
	76-44-8	Heptachlor	1 J	65000 NJ	µg/kg	C-8	56 / 149	1.7 - 9900	65000	NA	630 c	650	NRDCSCC	Yes	ASL	
	1024-57-3	Heptachlor Epoxide	0.59 J	2900	µg/kg	E-5	25 / 149	1.7 - 10000	2900	NA	330 c	NA	NRDCSCC	Yes	ASL	
	72-43-5	Methoxychlor	0.15 J	5 J	µg/kg	C-9	9 / 149	3.8 - 9900	5	NA	410000 n	5200000	NRDCSCC	No	BSL	
Inorganics																
	7429-90-5	Aluminum	5540 J	82400 J	mg/kg	B-1	211 / 211	15.1 - 1110	82400	NA	100000 nm	NA	NRDCSCC	No	BSL	
	7440-36-0	Antimony	0.38	2.4	mg/kg	C-8	8 / 211	0.21 - 1.7	2.4	NA	47 n	340	NRDCSCC	No	IFD	
	7440-38-2	Arsenic	0.48 J	11.4	mg/kg	F-11	186 / 211	0.5 - 3.3	11.4	NA	3 c	20	NRDCSCC	Yes	ASL	
	7440-39-3	Barium	15.6 J	219	mg/kg	C-15	211 / 211	5 - 32.6	219	NA	22000 n	47000	NRDCSCC	No	BSL	
	7440-41-7	Beryllium	0.1 J	1.8	mg/kg	C-15	115 / 211	0.43 - 5.5	1.8	NA	230 n	2	NRDCSCC	No	BSL	
	7440-43-9	Cadmium	0.05 J	4.8	mg/kg	C-8	105 / 211	0.42 - 3.3	4.8	NA	98 n	100	NRDCSCC	No	BSL	
	7440-70-2	Calcium	813	30400	mg/kg	F-12	211 / 211	378 - 27800	30400	NA	NA	NA	NRDCSCC	No	NUT	
	7440-47-3	Chromium	8.1	690	mg/kg	D-13A	211 / 211	1 - 109	690	NA	6.3 c ⁽¹³⁾	6100	NRDCSCC	Yes	ASL	
	7440-48-4	Cobalt	3	21.3	mg/kg	C-15	211 / 211	0.5 - 5.5	21.3	NA	35 n	NA	NRDCSCC	No	BSL	
	7440-50-8	Copper	2.3	1770	mg/kg	C-8	211 / 211	0.98 - 109	1770	NA	4700 n	600	NRDCSCC	No	BSL	
	7439-89-6	Iron	13800	118000	mg/kg	D-10	211 / 211	9.5 - 599	118000	NA	82000 n	NA	NRDCSCC	Yes	ASL	
	7439-92-1	Lead	1.8	181	mg/kg	C-8	211 / 211	0.5 - 53.6	181	NA	800 n ⁽¹⁴⁾	600	NRDCSCC	No	BSL	
	7439-95-4	Magnesium	660	29300 J	mg/kg	B-1	211 / 211	378 - 27800	29300	NA	NA	NA	NRDCSCC	No	NUT	

TABLE B-2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Curret/Future
Medium:	Soil
Exposure Medium:	Surface/Subsurface Soil

Exposure Point	CAS No.	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limit	Concentration Used for Screening ⁽¹⁾	Background Value	Screening Toxicity Value (n/c) ⁽²⁾	Potential ARAR/TBC Value ⁽³⁾	Potential ARAR/TBC Source ⁽³⁾	COPC Flag (Yes/No)	Rationale for Selection or Deletion ⁽⁴⁾
Surface/ Subsurface Soil	7439-96-5	Manganese	69.8	24800	mg/kg	E-5	208 / 211	0.5 - 712	24800	NA	2600 n	NA	NRDCSCC	Yes	ASL
	7439-97-6	Mercury	0.0013 J	0.15	mg/kg	CC-8/C-15	166 / 211	0.028 - 0.11	0.15	NA	35 n ⁽¹⁵⁾	270	NRDCSCC	No	BSL
	7440-02-0	Nickel	4.9	70.7	mg/kg	D-13A	211 / 211	0.5 - 5.5	70.7	NA	2200 n ⁽¹⁶⁾	2400	NRDCSCC	No	BSL
	7440-09-7	Potassium	508	5500 J	mg/kg	B-1	202 / 211	378 - 27800	5500	NA	NA	NA	NRDCSCC	No	NUT
	7782-49-2	Selenium	0.17 J	1.5	mg/kg	C-15/F-6/F-12	130 / 211	0.41 - 3	1.5	NA	580 n	3100	NRDCSCC	No	BSL
	7440-22-4	Silver	0.0009 J	1.4 J	mg/kg	C-4	52 / 211	0.42 - 3.3	1.4	NA	580 n	4100	NRDCSCC	No	BSL
	7440-23-5	Sodium	306 J	27800 J	mg/kg	B-1	50 / 211	378 - 27800	27800	NA	NA	NA	NRDCSCC	No	NUT
	7440-62-2	Vanadium	8.6 J	149	mg/kg	D-13A	210 / 211	2.5 - 283	149	NA	580 n ⁽¹⁷⁾	7100	NRDCSCC	No	BSL
	7440-66-6	Zinc	5.4	762	mg/kg	D-13B	208 / 211	1 - 131	762	NA	35000 n	1500	NRDCSCC	No	BSL

⁽¹⁾ Maximum detected concentration used for screening

⁽²⁾ Screened against Regional Screening Levels (RSL), November 2015, for industrial soil, adjusted to a cancer risk of 1x10⁻⁶ and hazard quotient of 0.1. <http://www.epa.gov/region09/waste/sfund/prg/index.html>. The screening level (SL) was adjusted for each chemical when the inhalation SL portion of the RSL exceeded the corresponding saturation concentration value.

⁽³⁾ Potential ARAR/TBC value from NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (May 1999)

⁽⁴⁾ Rationale Codes:

Selection Reason: ASL = above screening level
 TOX = Group A carcinogen
 Deletion Reason: BSL = below screening level
 NUT = essential nutrient
 NTX = no toxicity information available
 IFD = detection frequency less than 5%

⁽⁵⁾ screening value for 1,3-dichloropropene

⁽⁶⁾ screening value for acenaphthene

⁽⁷⁾ screening value for anthracene

⁽⁸⁾ screening value for chlordane

⁽⁹⁾ screening value for polychlorinated biphenyl

⁽¹⁰⁾ screening value for hexachlorocyclohexane, technical

⁽¹¹⁾ screening value for endosulfan

⁽¹²⁾ screening value for endrin

⁽¹³⁾ screening value for chromium VI

⁽¹⁴⁾ Office of Solid Waste and Emergency Response (OSWER) screening value for residential soil

⁽¹⁵⁾ screening value for mercuric chloride (and other mercury salts)

⁽¹⁶⁾ screening value for nickel soluble salts

⁽¹⁷⁾ screening value for vanadium and compounds

NA = not available

n = screening toxicity value based on noncancer effects

c = screening toxicity value based on cancer effects

COPC = chemical of potential concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = qualifier for estimated value

J+ = qualifier for estimated biased high value

JN = qualifier for estimated tentatively identified value

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

**TABLE B-3.1.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration ⁽¹⁾	Upper Confidence Limit ⁽¹⁾	Maximum Concentration (Qualifier)	Exposure Point Concentration ⁽²⁾			
						Value	Unit	Statistic	Rationale ⁽³⁾
Surface Soil	Volatile Organic Compounds								
	Trichloroethene	µg/kg	1.7	2.2	3.3 J	2.2	µg/kg	UCL-NP	95% KM (t) UCL
	Semi-volatile Organic Compounds								
	Benzo(a)pyrene	µg/kg	193	477	2400 J+	477	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Benzo(b)fluoranthene	µg/kg	313	765	3500 J+	765	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Pesticides/Polychlorinated Biphenyls								
	Aldrin	µg/kg	821	2888	21000 J	2888	µg/kg	UCL-NP	95% Adjusted Gamma KM-UCL
	Aroclor 1248	µg/kg	89266	389070	2300000	389070	µg/kg	UCL-NP	97.5% KM Chebyshev UCL
	Aroclor 1254	µg/kg	467	767	5600	767	µg/kg	UCL-NP	95% KM (t) UCL
	Dieldrin	µg/kg	1024	3729	20000	3729	µg/kg	UCL-NP	97.5% KM Chebyshev UCL
	Gamma-Chlordane	µg/kg	470	1730	9300 J	1730	µg/kg	UCL-NP	97.5% KM Chebyshev UCL
	Heptachlor	µg/kg	1106	7065	19000 JN	7065	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Heptachlor Epoxide	µg/kg	240	2302	2900	2302	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Inorganics								
	Arsenic	mg/kg	3.0	4.4	11.4	4.4	mg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Chromium	mg/kg	43	106	690	106	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
Manganese	mg/kg	930	3156	24800	3156	mg/kg	UCL-NP	95% KM (Chebyshev) UCL	

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram

J = qualifier for estimated value
J+ = qualifier for estimated biased high value
JN = qualifier for estimated tentatively identified value

KM = Kaplan-Meier

Notes:

⁽¹⁾ Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.

⁽²⁾ Exposure point concentration is lower of maximum concentration and UCL.

⁽³⁾ Rationale: UCL-NP = upper confidence limit of mean of non-parametric distribution

TABLE B-3.1.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration ⁽¹⁾	Upper Confidence Limit ⁽¹⁾	Maximum Concentration (Qualifier)	Exposure Point Concentration ⁽²⁾			
						Value	Unit	Statistic	Rationale ⁽³⁾
Surface Soil	Volatile Organic Compounds								
	Trichloroethene	µg/kg	2.3	2.8	14 J	2.8	µg/kg	UCL-NP	95% KM (t) UCL
	Semi-volatile Organic Compounds								
	Benzo(a)pyrene	µg/kg	146	339	2400 J+	339	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Benzo(b)fluoranthene	µg/kg	228	525	3500 J+	525	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Pesticides/Polychlorinated Biphenyls								
	Aldrin	µg/kg	590	2412	21000 J	2412	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Aroclor 1248	µg/kg	65337	258977	2300000	258977	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Aroclor 1254	µg/kg	305	620	5600	620	µg/kg	UCL-NP	95% Approximate Gamma KM-UCL
	Delta-BHC	µg/kg	91	321	1400 NJ	321	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Dieldrin	µg/kg	788	2574	20000	2574	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Gamma-Chlordane	µg/kg	353	1171	9300 J	1171	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Heptachlor	µg/kg	745	4430	19000 JN	4430	µg/kg	UCL-NP	99% KM (Chebyshev) UCL
	Heptachlor Epoxide	µg/kg	160	1137	2900	1137	µg/kg	UCL-NP	95% Adjusted Gamma KM-UCL
	Inorganics								
	Arsenic	mg/kg	2.7	3.0	11.4	3.0	mg/kg	UCL-NP	95% KM (BCA) UCL
	Chromium	mg/kg	35.4	75.8	690	75.8	mg/kg	UCL-NP	95% Chebyshev (Mean, Sd) UCL
Manganese	mg/kg	747	1414	24800	1414	mg/kg	UCL-NP	95% KM (BCA) UCL	

µg/kg = microgram per kilogram
 mg/kg = milligram per kilogram

J = qualifier for estimated value
 J+ = qualifier for estimated biased high value
 JN = qualifier for estimated tentatively identified value

KM = Kaplan-Meier
 BCA = bias-corrected accelerated bootstrap method

Notes:

(1) Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.

(2) Exposure point concentration is lower of maximum concentration and UCL.

(3) Rationale: UCL-NP = upper confidence limit of mean of non-parametric distribution
 Max = maximum detected concentration

TABLE B-3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe: Curret/Future
Medium: Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Point	Chemical of Potential Concern	Unit	Mean Concentration ⁽¹⁾	Upper Confidence Limit ⁽¹⁾	Maximum Concentration (Qualifier)	Exposure Point Concentration ⁽²⁾			
						Value	Unit	Statistic	Rationale ⁽³⁾
Surface/ Subsurface Soil	Volatile Organic Compounds								
	Trichloroethene	µg/kg	3.0	3.5	29	3.5	µg/kg	UCL-NP	95% KM (% Bootstrap) UCL
	Semi-volatile Organic Compounds								
	Benzo(a)anthracene	µg/kg	134	222	9100 J+	222	µg/kg	UCL-NP	95% KM (BCA) UCL
	Benzo(a)pyrene	µg/kg	142	233	8900 J+	233	µg/kg	UCL-NP	95% KM (BCA) UCL
	Benzo(b)fluoranthene	µg/kg	204	468	11000 J+	468	µg/kg	UCL-NP	95% KM (Chebyshev) UCL
	Pesticides/Polychlorinated Biphenyls								
	4,4'-DDE	µg/kg	804	3543	62000 J	3543	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	4,4'-DDT	µg/kg	503	2097	29000	2097	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Aldrin	µg/kg	1188	5281	92000 J	5281	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Alpha-Chlordane	µg/kg	312	1436	20000	1436	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Aroclor 1248	µg/kg	93070	319287	7000000	319287	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Aroclor 1254	µg/kg	334	1314	26000	1314	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Delta-BHC	µg/kg	71	198	1400 NJ	198	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Dieldrin	µg/kg	1450	5844	99000	5844	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Gamma-Chlordane	µg/kg	647	2552	43000	2552	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Heptachlor	µg/kg	1403	5490	65000 NJ	5490	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Heptachlor Epoxide	µg/kg	69	363	2900	363	µg/kg	UCL-NP	97.5% KM (Chebyshev) UCL
	Inorganics								
	Arsenic	mg/kg	2.8	3.0	11.4	3.0	mg/kg	UCL-NP	95% KM (BCA) UCL
Chromium	mg/kg	29.5	44.5	690	44.5	mg/kg	UCL-N	95% Chebyshev (Mean, Sd) UCL	
Iron	mg/kg	28598	29750	118000	29750	mg/kg	UCL-N	95% Modified-t UCL	
Manganese	mg/kg	553	790	24800	790	mg/kg	UCL-NP	95% KM (BCA) UCL	

µg/kg = microgram per kilogram
 mg/kg = milligram per kilogram

J = qualifier for estimated value
 J+ = qualifier for estimated biased high value
 JN = qualifier for estimated tentatively identified value

KM = Kaplan-Meier
 BCA = bias-corrected accelerated bootstrap method

Notes:

⁽¹⁾ Mean and upper confidence limit (UCL) concentrations are calculated using ProUCL version 5.0.00 for chemicals with at least 5 samples in a dataset and 4 detected values.

⁽²⁾ Exposure point concentration is lower of maximum concentration and UCL.

⁽³⁾ Rationale: UCL-N = upper confidence limit of mean of normal distribution
 UCL-NP = upper confidence limit of mean of non-parametric distribution
 Max = maximum detected concentration

TABLE B-4.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL EXPOSURE PATHWAYS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE	
							Value	Rationale/Reference	Value	Rationale/Reference
Ingestion	On-site Worker	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--
				IR-S	Ingestion Rate of Soil	mg/day	100	EPA 2014	100	EPA 2014
				RBA	Relative Bioavailability for Arsenic	unitless	0.6	EPA 2013	0.6	EPA 2013
				EF	Exposure Frequency	days/year	250	EPA 2014	219	EPA 2004
				ED	Exposure Duration	years	25	EPA 2014	9	EPA 2004
				BW	Body Weight	kg	80	EPA 2014	80	EPA 2014
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 2014	25,550	EPA 2014
				AT-N	Averaging Time (Noncancer)	days	9,125	EPA 1989	3,285	EPA 1989
	Trespasser	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--
				IR-S	Ingestion Rate of Soil	mg/day	100	EPA 2011	100	EPA 2011
				RBA	Relative Bioavailability for Arsenic	unitless	0.6	EPA 2013	0.6	EPA 2013
				EF	Exposure Frequency	days/year	100	(1)	50	(2)
				ED	Exposure Duration	years	8	(3)	8	(3)
				BW	Body Weight	kg	80	EPA 2014	80	EPA 2014
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 2014	25,550	EPA 2014
				AT-N	Averaging Time (Noncancer)	days	2,920	EPA 1989	2,920	EPA 1989
	Construction/ Utility Worker	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.2s	Tables B-3.2s	Not Evaluated	
				CF	Conversion Factor	kg/mg	1E-06	--		
				IR-S	Ingestion Rate of Soil	mg/day	330	EPA 2002		
				RBA	Relative Bioavailability for Arsenic	unitless	0.6	EPA 2013		
				EF	Exposure Frequency	days/year	100	(4)		
				ED	Exposure Duration	years	1	(4)		
				BW	Body Weight	kg	80	EPA 2014		
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 2014		
				AT-N	Averaging Time (Noncancer)	days	365	EPA 1989		
Dermal Contact	Worker	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--
				SA	Skin Surface Area Available for Contact	cm ² /day	3,470	EPA 2014	3,470	EPA 2014
				AF	Adherence Factor	mg/cm ²	0.12	EPA 2014	0.12	EPA 2014
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.2	chemical specific	Table B-4.2
				EF	Exposure Frequency	days/year	250	EPA 2014	219	EPA 2004
				ED	Exposure Duration	years	25	EPA 2014	9	EPA 2004
				BW	Body Weight	kg	80	EPA 2014	80	EPA 2014
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 2014	25,550	EPA 2014
				AT-N	Averaging Time (Noncancer)	days	9,125	EPA 1989	3,285	EPA 1989

TABLE B-4.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL EXPOSURE PATHWAYS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE				
							Value	Rationale/Reference	Value	Rationale/Reference			
Dermal Contact (continued)	Trespasser	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s			
				CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--			
				SA	Skin Surface Area Available for Contact	cm ² /day	6,032	EPA 2011 ⁽⁵⁾	6,032	EPA 2011 ⁽⁴⁾			
				AF	Adherence Factor	mg/cm ²	0.2	EPA 2004	0.2	EPA 2004			
				ABS	Absorption Factor	unitless	chemical specific	Table B-4.2	chemical specific	Table B-4.2			
				EF	Exposure Frequency	days/year	100	⁽¹⁾	50	⁽²⁾			
				ED	Exposure Duration	years	8	⁽³⁾	8	⁽³⁾			
				BW	Body Weight	kg	80	EPA 2014	80	EPA 2014			
				AT-C	Averaging Time (Cancer)	days	25,550	EPA 2014	25,550	EPA 2014			
				AT-N	Averaging Time (Noncancer)	days	2,920	EPA 1989	2,920	EPA 1989			
				Construction/ Utility Worker	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.2s	Tables B-3.2s	Not Evaluated	
	CF	Conversion Factor	kg/mg				1E-06	--					
	SA	Skin Surface Area Available for Contact	cm ² /day				3,470	EPA 2014					
	AF	Adherence Factor	mg/cm ²				0.3	EPA 2004					
	ABS	Absorption Factor	unitless				chemical specific	Table B-4.2					
	EF	Exposure Frequency	days/year				100	⁽³⁾					
	ED	Exposure Duration	years				1	⁽³⁾					
	BW	Body Weight	kg				80	EPA 2014					
	AT-C	Averaging Time (Cancer)	days	25,550	EPA 2014								
AT-N	Averaging Time (Noncancer)	days	365	EPA 1989									
Inhalation	Worker	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s			
				CA	Chemical Concentration in Air	mg/m ³	calculated	calculated	calculated	calculated			
				ET	Exposure Time	hrs/day	8	EPA 2014	4	⁽²⁾			
				EF	Exposure Frequency	days/year	250	EPA 2014	219	EPA 2004			
				ED	Exposure Duration	years	25	EPA 2014	9	EPA 2004			
				VF	Volatilization Factor	m ³ /kg	chemical specific	Table B-4.2	chemical specific	Table B-4.2			
				PEF	Particulate Emission Factor	m ³ /kg	1.36E+09	EPA 2002	1.36E+09	EPA 2002			
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 2014	613,200	EPA 2014			
				AT-N	Averaging Time (Noncancer)	hrs	219,000	EPA 1989	78,840	EPA 1989			
				Trespasser	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s	Tables B-3.1s
							CA	Chemical Concentration in Air	mg/m ³	calculated	calculated	calculated	calculated
	ET	Exposure Time	hrs/day				2	EPA 2009	1	⁽¹⁾			
	EF	Exposure Frequency	days/year				100	EPA 2009	50	⁽¹⁾			
	ED	Exposure Duration	years				8	⁽³⁾	8	⁽³⁾			
	VF	Volatilization Factor	m ³ /kg				chemical specific	Table B-4.2	chemical specific	Table B-4.2			
	PEF	Particulate Emission Factor	m ³ /kg				1.36E+09	EPA 2002	1.36E+09	EPA 2002			
	AT-C	Averaging Time (Cancer)	hrs				613,200	EPA 2014	613,200	EPA 2014			
	AT-N	Averaging Time (Noncancer)	hrs	70,080	EPA 1989	70,080	EPA 1989						

TABLE B-4.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL EXPOSURE PATHWAYS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Unit	RME		CTE	
							Value	Rationale/Reference	Value	Rationale/Reference
Inhalation (continued)	Construction/ Utility Worker	Adult	All Exposure Areas	CS	Chemical Concentration in Soil	mg/kg	Tables B-3.2s	Tables B-3.2s	Not Evaluated	
				CA	Chemical Concentration in Air	mg/m ³	calculated	calculated		
				ET	Exposure Time	hrs/day	8	EPA 2009		
				CF2	Conversion Factor 2	hrs/day	24	--		
				EF	Exposure Frequency	days/year	100	(3)		
				ED	Exposure Duration	years	1	(3)		
				VF	Volatilization Factor	m ³ /kg	chemical specific	Table B-4.2		
				PEF	Particulate Emission Factor	m ³ /kg	1.36E+09	EPA 2002		
				AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 2014		
				AT-N	Averaging Time (Noncancer)	hrs	8,760	EPA 1989		

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure

Notes:

- (1) assumes 2 days per week for 50 weeks
- (2) assumes one-half RME exposure frequency or exposure time
- (3) based on number of years in the age group of 18 to 26 years old
- (4) assumes 5 months (100 workdays) per year for one year
- (5) based on the weighted average surface area for head, hands, forearms, and lower legs for adult males and females 21+ years (Table 7-2) using forearm and lower legs ratios from Tables 7-12 and 7-13

Sources:

- EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
- EPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
- EPA 2004. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment Final. EPA/540/R/99/005.
- EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002.
- EPA 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-090/052F. September.
- EPA 2013. Personal Communication with EPA Region 2 Risk Assessor Ms. Urszula Filipowicz. June 19.
- EPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factor. OSWER Directive 9200.1-120. February 6.

TABLE B-4.1b
EQUATIONS USED FOR DAILY INTAKE CALCULATIONS FOR SOIL EXPOSURE PATHWAYS

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Ingestion Pathway

Arsenic

$$DI = \frac{CS \times CF \times RBA \times IR-S \times EF \times ED}{BW \times AT}$$

All Others

$$DI = \frac{CS \times CF \times IR-S \times EF \times ED}{BW \times AT}$$

Dermal Contact Pathway

$$DI = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Inhalation Pathway

Noncarcinogenic - Trespasser

$$EC = CA \quad (EPA 2009 Equation 7)$$

All Others

$$EC = CA \times ET \times EF \times ED / AT \quad (EPA 2009 Equation 8)$$

where CA = CS/VF for volatile or CA = CS/PEF

Sources:

- EPA 1989. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
- EPA 2000. Toxicological Review of Vinyl Chloride (CAS No. 75-01-4) in Support of Summary Information on the Integrated Risk Information System (IRIS). May.
- EPA 2004. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment Final. EPA/540/R/99/005
- EPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F.
<http://www.epa.gov/oswer/riskassessment/sghandbook/chemicals.htm>. March.
- EPA 2009. Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002.
- EPA 2011. Toxicological Review of Trichloroethylene (CAS No. 79-01-6) in Support of Summary Information on the Integrated Risk Information System (IRIS). September.

TABLE B-4.1b
EQUATIONS USED FOR DAILY INTAKE CALCULATIONS FOR SOIL EXPOSURE PATHWAYS

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

DI	Daily intake	mg/kg-day
CS	Chemical Concentration in Soil	mg/kg
CF	Conversion Factor	kg/mg
IR-S	Ingestion Rate of Soil	mg/day
RBA	Relative Bioavailability	unitless
SA	Skin Surface Area Available for Contact	cm ² /day
AF	Adherence Factor	mg/cm ²
ABS	Absorption Factor	unitless
EC	Exposure Concentration	mg/m ³
CA	Chemical Concentration in Air	mg/m ³
VF	Volatilization Factor	m ³ /kg
PEF	Particulate Emission Factor	m ³ /kg
ET	Exposure Time	hrs/day
EF	Exposure Frequency	days/year
ED	Exposure Duration	years
BW	Body Weight	kg
BW _a	Body Weight - adult	kg
AT-C	Averaging Time (Cancer)	days or hrs
	AT-C = 70 years x 365 days /year	
	AT-C = 70 years x 365 days /year x 24 hr/day -- inhalation pathway	
AT-N	Averaging Time (Noncancer)	days or hrs
	AT-N = ED x 365 days/year	
	AT-N = ED x 365 days/year x 24 hr/day -- inhalation pathway	

TABLE B-4.2
CHEMICAL-SPECIFIC INFORMATION USED FOR DAILY INTAKE CALCULATIONS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical	Dermal Absorption Fraction ⁽¹⁾ (Unitless)	Henry's Law Constant ⁽²⁾		Diffusivity in Air ⁽²⁾ (cm ² /s)	Diffusivity in Water ⁽²⁾ (cm ² /s)	Soil Organic Carbon Partition Coefficient ⁽²⁾ (L/kg)	Soil-Water Partition Coefficient (cm ³ /g)	Apparent Diffusivity ⁽³⁾ (cm ² /s)	Volatilization factor ⁽³⁾ (m ³ /kg)
		(atm-m ³ /mole)	Unitless						
Volatile Organic Compounds									
Trichloroethene	NA	9.9E-03	4.0E-01	6.9E-02	1.0E-05	6.1E+01	3.6E-01	2.7E-03	2.4E+03
Semi-volatile Organic Compounds									
Benzo(a)anthracene	1.3E-01	1.2E-05	4.9E-04	5.1E-02	5.9E-06	1.8E+05	1.1E+03	1.3E-09	3.5E+06
Benzo(a)pyrene	1.3E-01	4.6E-07	1.9E-05	4.8E-02	5.6E-06	5.9E+05	3.5E+03	2.3E-11	NA
Benzo(b)fluoranthene	1.3E-01	6.6E-07	2.7E-05	4.8E-02	5.6E-06	6.0E+05	3.6E+03	2.8E-11	NA
Pesticides/Polychlorinated Biphenyls									
4,4'-DDE	NA	4.2E-05	1.7E-03	2.3E-02	5.9E-06	1.2E+05	7.1E+02	2.9E-09	2.3E+06
4,4'-DDT	3.0E-02	8.3E-06	3.4E-04	3.8E-02	4.4E-06	1.7E+05	1.0E+03	6.9E-10	NA
Aldrin	NA	4.4E-05	1.8E-03	2.3E-02	5.8E-06	8.2E+04	4.9E+02	4.4E-09	1.9E+06
Alpha-Chlordane ⁽⁴⁾	NA	7.0E-05	2.9E-03	2.1E-02	5.4E-06	3.4E+04	2.0E+02	1.6E-08	NA
Aroclor 1248	1.4E-01	4.4E-04	1.8E-02	1.6E-02	3.9E-06	7.7E+04	4.6E+02	3.3E-08	6.8E+05
Aroclor 1254	1.4E-01	2.8E-04	1.2E-02	2.4E-02	6.1E-06	1.3E+05	7.8E+02	1.8E-08	9.2E+05
Delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	1.0E-05	4.1E-04	2.3E-02	6.0E-06	2.0E+04	1.2E+02	4.4E-09	NA
Gamma-Chlordane ⁽⁴⁾	NA	4.4E-04	1.8E-02	1.6E-02	3.9E-06	7.7E+04	4.6E+02	3.3E-08	NA
Heptachlor	NA	2.9E-04	1.2E-02	2.2E-02	5.7E-06	4.1E+04	2.5E+02	5.6E-08	5.2E+05
Heptachlor Epoxide	NA	2.1E-05	8.6E-04	2.4E-02	6.2E-06	1.0E+04	6.1E+01	1.8E-08	9.2E+05
Inorganics									
Arsenic	3.0E-02	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE B-4.2
CHEMICAL-SPECIFIC INFORMATION USED FOR DAILY INTAKE CALCULATIONS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

NA - Not applicable

Notes:

(1) Source: EPA 2004. Risk Assessment Guidance for Superfund. Part E.

(2) Source: EPA 2015. Regional Screening Levels for Chemical Contaminants at Superfund Sites. November.

(3) Volatilization Factor is calculated using Equation 4-8 from Soil Screening Guidance (EPA 2002) (p.4-24)

$$D_A = \frac{(\theta_a^{10/3} D_i H' + \theta_w^{10/3} D_w)/n^2}{\rho_b K_d + \theta_w + \theta_a H'}$$

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

where:

VF = volatilization factor, m³/kg

D_i = diffusion coefficient in air, cm²/s

D_w = diffusion coefficient in water, cm²/s

K_d = soil-water partition coefficient, cm³/g = K_{oc} × f_{oc}

f_{oc} = fraction organic carbon in soil, g/g = 0.006

K_{oc} = soil organic carbon partition coefficient, cm³/g

T = exposure interval, s = 9.5 × 10⁸

Q/C = inverse of the ratio of the geometric mean air concentration to the volatilization flux at center of a square source, g/m²-s per kg/m³ = 68.18

H' = Dimensionless Henry's law constant

D_A = apparent diffusivity, cm²/s

θ_a = air filled soil porosity = n - θ_w = 0.28

θ_w = water-filled soil porosity = 0.15

n = total porosity = 1 - ρ_b/ρ_s = 0.43

ρ_b = dry soil bulk density, g/cm³ = 1.5

ρ_s = soil particle density, g/cm³ = 2.65

TABLE B-5.1
NONCANCER TOXICITY DATA - ORAL/DERMAL
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed RfD for Dermal ⁽²⁾		Primary Target Organ	Combined Uncertainty/ Modifying Factor	Source	Date ⁽³⁾
		Value	Unit		Value	Unit				
Volatile Organic Compounds										
Trichloroethene	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Heart/ Immune System/ Developmental/Kidney	10 to 1,000	IRIS	1/11/2016
Semi-volatile Organic Compounds										
Benzo(a)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
PCBs/Pesticides										
4,4'-DDE	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
4,4'-DDT	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	100	IRIS	1/11/2016
Aldrin	Chronic	3.0E-05	mg/kg-day	1	3.0E-05	mg/kg-day	Liver	1,000	IRIS	1/11/2016
Alpha-Chlordane ⁽⁴⁾	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	300	IRIS	1/11/2016
Aroclor 1248 ⁽⁵⁾	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye/Finger/Toe Nail/Immune System	300	IRIS	1/11/2016
Aroclor 1254	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	Eye/Finger/Toe Nail/Immune System	300	IRIS	1/11/2016
Delta-BHC	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Dieldrin	Chronic	5.0E-05	mg/kg-day	1	5.0E-05	mg/kg-day	Liver	100	IRIS	1/11/2016
Gamma-Chlordane ⁽⁴⁾	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	300	IRIS	1/11/2016
Heptachlor	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Liver	300	IRIS	1/11/2016
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg-day	1	1.3E-05	mg/kg-day	Liver	1,000	IRIS	1/11/2016
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin	3	IRIS	1/11/2016
Chromium ⁽⁶⁾	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None reported	300	IRIS	1/11/2016
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	GI Tract	1.5	PPRTV	9/11/2006
Manganese	Chronic	1.4E-01	mg/kg-day	0.04	5.6E-03	mg/kg-day	CNS	1	IRIS	1/11/2016

⁽¹⁾ Oral Absorption Efficiency for Dermal from Regional Screening Levels, November 2015
<http://www.epa.gov/region09/waste/sfund/prg/index.html>

⁽²⁾ Adjusted RfD for Dermal = Oral RfD x Oral Absorption Efficiency for Dermal.

⁽³⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
 Date shown for other sources is the publication date.

⁽⁴⁾ based on chlordane (technical)

⁽⁵⁾ based on Aroclor 1254

⁽⁶⁾ based on chromium (VI)

Definition:

CNS = central nervous system

GI = gastrointestinal

IRIS = Integrated Risk Information System

mg/kg-day = milligram per kilogram per day

NA = not available

PPRTV = Provisional Peer Reviewed Toxicity Value

RfD = reference dose

TABLE B-5.2a
NONCANCER TOXICITY DATA - INHALATION (CHRONIC)
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/Modifying Factor	RfC Target Organ	
	Value	Unit			Source	Date ⁽¹⁾
Volatile Organic Compounds						
Trichloroethene	2.0E-03	mg/m ³	Heart/Immune System/Liver	10 to 100	IRIS	1/11/2016
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDE	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA
Alpha-Chlordane ⁽²⁾	7.0E-04	mg/m ³	Liver	1,000	IRIS	1/11/2016
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Gamma-Chlordane ⁽²⁾	7.0E-04	mg/m ³	Liver	1,000	IRIS	1/11/2016
Heptachlor	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Arsenic	1.5E-05	mg/m ³	Developmental/Cardiovascular System/ Nervous System/Lung/Skin	30	Cal/EPA	1/11/2016
Chromium ⁽³⁾	1.0E-04	mg/m ³	Lung	300	IRIS	1/11/2016
Iron	NA	NA	NA	NA	NA	NA
Manganese	5.0E-05	mg/m ³	CNS	1,000	IRIS	1/11/2016

⁽¹⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
 Date shown for other sources is the publication date.

⁽²⁾ based on chlordane (technical)

⁽³⁾ based on chromium (VI) particulates

Definition:

Cal/EPA = California Environmental Protection Agency

CNS = central nervous system

IRIS = Integrated Risk Information System

mg/m³ = milligram per cubic meter

NA = not available

RfC = reference concentration

TABLE B-5.2b
NONCANCER TOXICITY DATA - INHALATION (ACUTE)
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Inhalation RfC		Primary Target Organ	Combined Uncertainty/ Modifying Factor	RfC Target Organ	
	Value	Unit			Source	Date ⁽¹⁾
Volatile Organic Compounds						
Trichloroethene	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds						
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Pesticides/Polychlorinated Biphenyls						
4,4'-DDE	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA
Alpha-Chlordane ⁽²⁾	2.0E-04	mg/m ³	Liver	100	ATSDR	10/2015
Aroclor 1248	NA	NA	NA	NA	NA	NA
Aroclor 1254	NA	NA	NA	NA	NA	NA
Delta-BHC	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Gamma-Chlordane ⁽²⁾	2.0E-04	mg/m ³	Liver	100	ATSDR	10/2015
Heptachlor	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Inorganics						
Arsenic	2.0E-04	mg/m ³	Developmental/Cardiovascular System/Nervous System	1,000	Cal/EPA	1/11/2016
Chromium ⁽³⁾	3.0E-04	mg/m ³	Respiratory System	30	ATSDR	7/12/2013
Iron	NA	NA	NA	NA	NA	NA
Manganese	1.7E-04	mg/m ³	Nervous System	300	Cal/EPA	1/11/2016

⁽¹⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
 Date shown for other sources is the publication date.

⁽²⁾ based on chlordane (technical)

⁽³⁾ based on chromium (VI), particulates

Definition:

ATSDR = Agency for Toxic Substances and Disease Registry

Cal/EPA = California Environmental Protection Agency

mg/m³ = milligram per cubic meter

NA = not available

RfC = reference concentration

TABLE B-6.1
CANCER TOXICITY DATA - ORAL/DERMAL
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed Slope Factor for Dermal ⁽²⁾		Mutagen ⁽³⁾	Weight of Evidence/ Cancer Guideline Description	Source	Date ⁽⁴⁾
	Value	Unit		Value	Unit				
Volatile Organic Compounds									
Trichloroethene ⁽⁵⁾	4.6E-02	(mg/kg-day) ⁻¹	1	4.6E-02	(mg/kg-day) ⁻¹	M	carcinogenic to humans	IRIS	1/11/2016
Semi-volatile Organic Compounds									
Benzo(a)anthracene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	M	B2	EPA	7/1/1993
Benzo(a)pyrene	7.3E+00	(mg/kg-day) ⁻¹	1	7.3E+00	(mg/kg-day) ⁻¹	M	B2	IRIS	1/11/2016
Benzo(b)fluoranthene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	M	B2	EPA	7/1/1993
Pesticides/Polychlorinated Biphenyls									
4,4'-DDE	3.4E-01	(mg/kg-day) ⁻¹	1	3.4E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
4,4'-DDT	3.4E-01	(mg/kg-day) ⁻¹	1	3.4E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Aldrin	1.7E+01	(mg/kg-day) ⁻¹	1	1.7E+01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Alpha-Chlordane ⁽⁶⁾	3.5E-01	(mg/kg-day) ⁻¹	1	3.5E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1248 ⁽⁷⁾	2.0E+00	(mg/kg-day) ⁻¹	1	2.0E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1254 ⁽⁷⁾	2.0E+00	(mg/kg-day) ⁻¹	1	2.0E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Delta-BHC ⁽⁸⁾	1.8E+00	(mg/kg-day) ⁻¹	1	1.8E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Dieldrin	1.6E+01	(mg/kg-day) ⁻¹	1	1.6E+01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Gamma-Chlordane ⁽⁶⁾	3.5E-01	(mg/kg-day) ⁻¹	1	3.5E-01	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor	4.5E+00	(mg/kg-day) ⁻¹	1	4.5E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor Epoxide	9.1E+00	(mg/kg-day) ⁻¹	1	9.1E+00	(mg/kg-day) ⁻¹	--	B2	IRIS	1/11/2016
Inorganics									
Arsenic	1.5E+00	(mg/kg-day) ⁻¹	1	1.5E+00	(mg/kg-day) ⁻¹	--	A	IRIS	1/11/2016
Chromium ⁽⁹⁾	5.0E-01	(mg/kg-day) ⁻¹	0.025	5.0E-01	(mg/kg-day) ⁻¹	--	likely to be carcinogenic to humans	NJDEP	4/8/2009
Iron	NA	NA	1	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Manganese	NA	NA	0.04	NA	NA	--	D	IRIS	1/11/2016

TABLE B-6.1
CANCER TOXICITY DATA - ORAL/DERMAL
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

- ⁽¹⁾ Oral Absorption Efficiency for Dermal from Regional Screening Levels, November 2015
<http://www.epa.gov/region09/waste/sfund/prg/index.html>
- ⁽²⁾ Oral slope factor (SF) for Dermal = Oral SF
- ⁽³⁾ Identified as a mutagen on the Regional Screening Level Table, November 2015
- ⁽⁴⁾ Date shown for IRIS is the date IRIS was searched. <http://www.epa.gov/iris/>
Date shown for other sources is the publication date.
- ⁽⁵⁾ TCE is considered carcinogenic by a mutagenic mode of action for induction of kidney tumors.
The adult-based oral SF for kidney cancer is 9.3×10^{-3} per mg/kg/day
- ⁽⁶⁾ based on chlordane (technical)
- ⁽⁷⁾ based on upper-bound SF for high risk and persistence polychlorinated biphenyls
- ⁽⁸⁾ based on technical BHC
- ⁽⁹⁾ based on chromium (VI)

Definition:
EPA = EPA Provisional Guidance for Quantitative Assessment of
Polycyclic Aromatic Hydrocarbons
IRIS = Integrated Risk Information System
M = mutagen
mg/kg-day = milligram per kilogram per day
NA = not available
NJDEP = New Jersey Department of Environmental Protection
PPRTV = Provisional Peer Reviewed Toxicity Value

EPA Weight of Evidence (EPA 1986, EPA 1996):

- A - Human carcinogen
- B1 - Probable human carcinogen
indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in
animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as human carcinogen

EPA Weight of Evidence Narrative (EPA 2005):

- Carcinogenic to human
- Likely to be carcinogenic to humans
- Suggestive evidence of carcinogenic potential
- Inadequate information to assess carcinogenic potential
- Not likely to be carcinogenic to humans

TABLE B-6.2
CANCER TOXICITY DATA - INHALATION
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Chemical of Potential Concern	Inhalation Unit Risk		Mutagen ⁽¹⁾	Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value	Unit			Source	Date ⁽²⁾
Volatile Organic Compounds						
Trichloroethene ⁽³⁾	4.1E-06	($\mu\text{g}/\text{m}^3$) ⁻¹	M	carcinogenic to humans	IRIS	1/11/2016
Semi-volatile Organic Compounds						
Benzo(a)anthracene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	M	B2	Cal/EPA	1/11/2016
Benzo(a)pyrene	1.1E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	M	B2	Cal/EPA	2011
Benzo(b)fluoranthene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	M	B2	Cal/EPA	1/11/2016
Pesticides/Polychlorinated Biphenyls						
4,4'-DDE	9.7E-05	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	CalEPA	1/11/2016
4,4'-DDT	9.7E-05	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Aldrin	4.9E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Alpha-Chlordane ⁽⁴⁾	1.0E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1248 ⁽⁵⁾	5.7E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Aroclor 1254 ⁽⁵⁾	5.7E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Delta-BHC ⁽⁶⁾	5.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	D	IRIS	1/11/2016
Dieldrin	4.6E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Gamma-Chlordane ⁽⁴⁾	1.0E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor	1.3E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Heptachlor Epoxide	2.6E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	B2	IRIS	1/11/2016
Inorganics						
Arsenic	4.3E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	--	A	IRIS	1/11/2016
Chromium ⁽⁷⁾	1.2E-02	($\mu\text{g}/\text{m}^3$) ⁻¹	--	A	IRIS	1/11/2016
Iron	NA	NA	--	inadequate information to assess the carcinogenic potential	PPRTV	9/11/2006
Manganese	NA	NA	--	D	IRIS	1/11/2016

TABLE B-6.2
CANCER TOXICITY DATA - INHALATION
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

- | | |
|---|---|
| <p>(1) Identified as a mutagen on the Regional Screening Level (RSL) Table, January 2015, http://www.epa.gov/region09/waste/sfund/prg/index.html</p> <p>(2) Date shown for IRIS is the date IRIS was searched. http://www.epa.gov/iris/
Date shown for other sources is the publication date.</p> <p>(3) TCE is considered carcinogenic by a mutagenic mode of action for induction of kidney tumors. The adult-based IUR for kidney cancer is 1×10^{-6} per $\mu\text{g}/\text{m}^3$.</p> <p>(4) based on chlordane (technical)</p> <p>(5) based on upper-bound IUR for the high risk polychlorinated biphenyls</p> <p>(6) based on technical BHC</p> <p>(7) based on chromium (VI)</p> | <p>Definition:
 Cal/EPA = California Environmental Protection Agency
 IRIS = Integrated Risk Information System
 M = mutagen
 NA = not available
 $\mu\text{g}/\text{m}^3$ = microgram per cubic meter
 PPRTV = Provisional Peer Reviewed Toxicity Value</p> |
|---|---|

EPA Weight of Evidence (EPA 1986, EPA 1996):

- A - Human Carcinogen
- B1 - Probable human carcinogen
indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as human carcinogen

EPA Weight of Evidence Narrative (EPA 2005):

- Carcinogenic to human
- Likely to be carcinogenic to humans
- Suggestive evidence of carcinogenic potential
- Inadequate information to assess carcinogenic potential
- Not likely to be carcinogenic to humans

TABLE B-7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
					Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RID/RIC		Hazard Quotient		
					Value	Unit	Value	Unit		Value	Unit	Value	Unit			
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	6.65E-10	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	3.06E-11	1.86E-09	mg/kg-day	5.00E-04	mg/kg-day	3.72E-06
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	1.46E-07	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	1.06E-06	4.08E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	2.34E-07	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	1.71E-07	6.55E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	8.83E-07	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	1.50E-05	2.47E-06	mg/kg-day	3.00E-05	mg/kg-day	8.24E-02
				Aroclor 1248	3.89E+02	mg/kg	1.19E-04	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	2.38E-04	3.33E-04	mg/kg-day	2.00E-05	mg/kg-day	1.67E+01
				Aroclor 1254	7.67E-01	mg/kg	2.34E-07	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.69E-07	6.57E-07	mg/kg-day	2.00E-05	mg/kg-day	3.28E-02
				Dieldrin	3.73E+00	mg/kg	1.14E-06	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	1.82E-05	3.19E-06	mg/kg-day	5.00E-05	mg/kg-day	6.39E-02
				Gamma-Chlordane	1.73E+00	mg/kg	5.29E-07	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	1.85E-07	1.48E-06	mg/kg-day	5.00E-04	mg/kg-day	2.96E-03
				Heptachlor	7.07E+00	mg/kg	2.16E-06	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	9.72E-06	6.05E-06	mg/kg-day	5.00E-04	mg/kg-day	1.21E-02
				Heptachlor Epoxide	2.30E+00	mg/kg	7.04E-07	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	6.41E-06	1.97E-06	mg/kg-day	1.30E-05	mg/kg-day	1.52E-01
				Inorganics Arsenic	4.42E+00	mg/kg	8.12E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	1.22E-06	2.27E-06	mg/kg-day	3.00E-04	mg/kg-day	7.58E-03
				Chromium	1.06E+02	mg/kg	3.23E-05	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	1.62E-05	9.05E-05	mg/kg-day	3.00E-03	mg/kg-day	3.02E-02
				Manganese	3.16E+03	mg/kg	9.65E-04	mg/kg-day	NA	NA	NA	2.70E-03	mg/kg-day	1.40E-01	mg/kg-day	1.93E-02
				Exp. Route Total							3.07E-04					1.71E+01
Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	7.89E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	5.76E-07	2.21E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	1.27E-07	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	9.24E-08	3.54E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA
				Aroclor 1248	3.89E+02	mg/kg	6.94E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.39E-04	1.94E-04	mg/kg-day	2.00E-05	mg/kg-day	9.71E+00
				Aroclor 1254	7.67E-01	mg/kg	1.37E-07	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	2.73E-07	3.83E-07	mg/kg-day	2.00E-05	mg/kg-day	1.91E-02
				Dieldrin	3.73E+00	mg/kg	NA	NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA
				Gamma-Chlordane	1.73E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor	7.07E+00	mg/kg	NA	NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor Epoxide	2.30E+00	mg/kg	NA	NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA
				Inorganics Arsenic	4.42E+00	mg/kg	1.69E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	2.53E-07	4.73E-07	mg/kg-day	3.00E-04	mg/kg-day	1.58E-03
				Chromium	1.06E+02	mg/kg	NA	NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Manganese	3.16E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Exp. Route Total							1.40E-04					9.73E+00
Surface Soil	Surface Soil	Surface Soil	Inhalation	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	7.36E-05	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	3.02E-10	2.06E-07	mg/m ³	2.00E-03	mg/m ³	1.03E-04
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	2.86E-08	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	3.14E-11	8.00E-11	mg/m ³	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	4.58E-08	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	5.04E-12	1.28E-10	mg/m ³	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	1.26E-04	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	6.16E-07	3.52E-07	mg/m ³	NA	NA	NA
				Aroclor 1248	3.89E+02	mg/kg	4.65E-02	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	2.65E-05	1.30E-04	mg/m ³	NA	NA	NA
				Aroclor 1254	7.67E-01	mg/kg	6.80E-05	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	3.87E-08	1.90E-07	mg/m ³	NA	NA	NA
				Dieldrin	3.73E+00	mg/kg	2.24E-07	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	1.03E-09	6.26E-10	mg/m ³	NA	NA	NA
				Gamma-Chlordane	1.73E+00	mg/kg	1.04E-07	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	1.04E-11	2.90E-10	mg/m ³	7.00E-04	mg/m ³	4.15E-07
				Heptachlor	7.07E+00	mg/kg	1.10E-03	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	1.43E-06	3.08E-06	mg/m ³	NA	NA	NA
				Heptachlor Epoxide	2.30E+00	mg/kg	2.04E-04	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	5.31E-07	5.72E-07	mg/m ³	NA	NA	NA
				Inorganics Arsenic	4.42E+00	mg/kg	2.65E-07	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	1.14E-09	7.43E-10	mg/m ³	1.50E-05	mg/m ³	4.95E-05
				Chromium	1.06E+02	mg/kg	6.34E-06	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	7.60E-08	1.77E-08	mg/m ³	1.00E-04	mg/m ³	1.77E-04
				Manganese	3.16E+03	mg/kg	1.89E-04	µg/m ³	NA	NA	NA	5.30E-07	mg/m ³	5.00E-05	mg/m ³	1.06E-02
				Exp. Route Total							2.92E-05					1.09E-02
				Exposure Point Total							4.76E-04					2.68E+01

NA = not applicable

RID = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

TABLE B-7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
					Value		Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer	Intake/ Exposure Concentration		RfD/RfC		Hazard
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	8.51E-11	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	3.92E-12	7.45E-10	mg/kg-day	5.00E-04	mg/kg-day	1.49E-06
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	1.87E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	1.36E-07	1.63E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	2.99E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	2.18E-08	2.62E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	1.13E-07	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	1.92E-06	9.89E-07	mg/kg-day	3.00E-05	mg/kg-day	3.30E-02
				Aroclor 1248	3.89E+02	mg/kg	1.52E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	3.05E-05	1.33E-04	mg/kg-day	2.00E-05	mg/kg-day	6.66E+00
				Aroclor 1254	7.67E-01	mg/kg	3.00E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	6.00E-08	2.63E-07	mg/kg-day	2.00E-05	mg/kg-day	1.31E-02
				Dieldrin	3.73E+00	mg/kg	1.46E-07	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	2.34E-06	1.28E-06	mg/kg-day	5.00E-05	mg/kg-day	2.55E-02
				Gamma-Chlordane	1.73E+00	mg/kg	6.77E-08	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	2.37E-08	5.92E-07	mg/kg-day	5.00E-04	mg/kg-day	1.18E-03
				Heptachlor	7.07E+00	mg/kg	2.77E-07	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	1.24E-06	2.42E-06	mg/kg-day	5.00E-04	mg/kg-day	4.84E-03
				Heptachlor Epoxide	2.30E+00	mg/kg	9.01E-08	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	8.20E-07	7.88E-07	mg/kg-day	1.30E-05	mg/kg-day	6.06E-02
				Inorganics Arsenic	4.42E+00	mg/kg	1.04E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	1.56E-07	9.09E-07	mg/kg-day	3.00E-04	mg/kg-day	3.03E-03
				Chromium	1.06E+02	mg/kg	4.14E-06	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	2.07E-06	3.62E-05	mg/kg-day	3.00E-03	mg/kg-day	1.21E-02
				Manganese	3.16E+03	mg/kg	1.24E-04	mg/kg-day	NA	NA	NA	1.08E-03	mg/kg-day	1.40E-01	mg/kg-day	7.72E-03
Exp. Route Total											3.92E-05					6.82E+00
Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	2.93E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	2.14E-07	2.56E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	4.69E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	3.43E-08	4.11E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA
				Aroclor 1248	3.89E+02	mg/kg	2.57E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	5.14E-05	2.25E-04	mg/kg-day	2.00E-05	mg/kg-day	1.13E+01
				Aroclor 1254	7.67E-01	mg/kg	5.07E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.01E-07	4.44E-07	mg/kg-day	2.00E-05	mg/kg-day	2.22E-02
				Dieldrin	3.73E+00	mg/kg	NA	NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA
				Gamma-Chlordane	1.73E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor	7.07E+00	mg/kg	NA	NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor Epoxide	2.30E+00	mg/kg	NA	NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA
				Inorganics Arsenic	4.42E+00	mg/kg	6.27E-08	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	9.40E-08	5.48E-07	mg/kg-day	3.00E-04	mg/kg-day	1.83E-03
				Chromium	1.06E+02	mg/kg	NA	NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Manganese	3.16E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
Exp. Route Total											5.19E-05					1.13E+01
Surface Soil	Surface Soil	Surface Soil	Inhalation	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	2.36E-06	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	9.66E-12	9.03E-07	mg/m ³	2.00E-03	mg/m ³	4.51E-04
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	9.14E-10	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	1.01E-12	3.50E-10	mg/m ³	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	1.47E-09	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	1.61E-13	5.62E-10	mg/m ³	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	4.02E-06	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	1.97E-08	1.54E-06	mg/m ³	NA	NA	NA
				Aroclor 1248	3.89E+02	mg/kg	1.49E-03	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	8.48E-07	5.70E-04	mg/m ³	NA	NA	NA
				Aroclor 1254	7.67E-01	mg/kg	2.17E-06	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	1.24E-09	8.33E-07	mg/m ³	NA	NA	NA
				Dieldrin	3.73E+00	mg/kg	7.15E-09	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	3.29E-11	2.74E-09	mg/m ³	NA	NA	NA
				Gamma-Chlordane	1.73E+00	mg/kg	3.32E-09	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	3.32E-13	1.27E-09	mg/m ³	2.00E-04	mg/m ³	6.36E-06
				Heptachlor	7.07E+00	mg/kg	3.52E-05	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	4.58E-08	1.35E-05	mg/m ³	NA	NA	NA
				Heptachlor Epoxide	2.30E+00	mg/kg	6.53E-06	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	1.70E-08	2.50E-06	mg/m ³	NA	NA	NA
				Inorganics Arsenic	4.42E+00	mg/kg	8.49E-09	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	3.65E-11	3.25E-09	mg/m ³	2.00E-04	mg/m ³	1.63E-05
				Chromium	1.06E+02	mg/kg	2.03E-07	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	2.43E-09	7.77E-08	mg/m ³	3.00E-04	mg/m ³	2.59E-04
				Manganese	3.16E+03	mg/kg	6.06E-06	µg/m ³	NA	NA	NA	2.32E-06	mg/m ³	1.70E-04	mg/m ³	1.37E-02
Exp. Route Total											9.34E-07					1.44E-02
Exposure Point Total											9.21E-05					1.81E+01

NA = not applicable

RfD = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

TABLE B-7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				Noncancer Hazard Calculation					
					Value	Unit	Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RID/RIC		Hazard Quotient
							Value	Unit	Value	Unit		Value	Unit	Value	Unit	
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatle Organic Compounds	2.80E-03	mg/kg	8.57E-10	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	3.94E-11	2.40E-09	mg/kg-day	5.00E-04	mg/kg-day	4.80E-06
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	1.04E-07	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	7.56E-07	2.90E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	5.25E-01	mg/kg	1.61E-07	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	1.17E-07	4.50E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls	2.41E+00	mg/kg	7.38E-07	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	1.25E-05	2.07E-06	mg/kg-day	3.00E-05	mg/kg-day	6.88E-02
				Aldrin	2.59E+02	mg/kg	7.92E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.58E-04	2.22E-04	mg/kg-day	2.00E-05	mg/kg-day	1.11E+01
				Aroclor 1254	6.20E-01	mg/kg	1.90E-07	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	3.79E-07	5.31E-07	mg/kg-day	2.00E-05	mg/kg-day	2.65E-02
				Delta-BHC	3.21E-01	mg/kg	9.83E-08	mg/kg-day	1.80E+00	(mg/kg-day) ⁻¹	1.77E-07	2.75E-07	mg/kg-day	NA	NA	NA
				Dieldrin	2.57E+00	mg/kg	7.87E-07	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	1.26E-05	2.20E-06	mg/kg-day	5.00E-05	mg/kg-day	4.41E-02
				Gamma-Chlordane	1.17E+00	mg/kg	3.58E-07	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	1.25E-07	1.00E-06	mg/kg-day	5.00E-04	mg/kg-day	2.01E-03
				Heptachlor	4.43E+00	mg/kg	1.35E-06	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	6.10E-06	3.79E-06	mg/kg-day	5.00E-04	mg/kg-day	7.59E-03
				Heptachlor Epoxide	1.14E+00	mg/kg	3.48E-07	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	3.16E-06	9.73E-07	mg/kg-day	1.30E-05	mg/kg-day	7.49E-02
				Inorganics	3.04E+00	mg/kg	5.58E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	8.37E-07	1.56E-06	mg/kg-day	3.00E-04	mg/kg-day	5.21E-03
				Arsenic	7.58E+01	mg/kg	2.32E-05	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	1.16E-05	6.49E-05	mg/kg-day	3.00E-03	mg/kg-day	2.16E-02
				Chromium	1.41E+03	mg/kg	4.32E-04	mg/kg-day	NA	NA	NA	1.21E-03	mg/kg-day	1.40E-01	mg/kg-day	8.65E-03
				Manganese												
			Exp. Route Total								2.07E-04					1.13E+01
Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatle Organic Compounds	2.80E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	5.61E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	4.09E-07	1.57E-07	mg/kg-day	NA	NA	NA
				Benzo(a)pyrene	5.25E-01	mg/kg	8.70E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	6.35E-08	2.44E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls	2.41E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA
				Aldrin	2.59E+02	mg/kg	4.62E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	9.23E-05	1.29E-04	mg/kg-day	2.00E-05	mg/kg-day	6.46E+00
				Aroclor 1254	6.20E-01	mg/kg	1.11E-07	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	2.21E-07	3.09E-07	mg/kg-day	2.00E-05	mg/kg-day	1.55E-02
				Delta-BHC	3.21E-01	mg/kg	NA	NA	1.80E+00	(mg/kg-day) ⁻¹	NA	NA	NA	NA	NA	NA
				Dieldrin	2.57E+00	mg/kg	NA	NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA
				Gamma-Chlordane	1.17E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor	4.43E+00	mg/kg	NA	NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor Epoxide	1.14E+00	mg/kg	NA	NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA
				Inorganics	3.04E+00	mg/kg	1.16E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	1.74E-07	3.25E-07	mg/kg-day	3.00E-04	mg/kg-day	1.08E-03
				Arsenic	7.58E+01	mg/kg	NA	NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Chromium	1.41E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Manganese												
			Exp. Route Total								9.32E-05					6.48E+00
Surface Soil	Surface Soil	Surface Soil	Inhalation	Volatle Organic Compounds	2.80E-03	mg/kg	9.48E-05	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	3.89E-10	2.66E-07	mg/m ³	2.00E-03	mg/m ³	1.33E-04
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	2.03E-08	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	2.24E-11	5.69E-11	mg/m ³	NA	NA	NA
				Benzo(a)pyrene	5.25E-01	mg/kg	3.15E-08	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	3.47E-12	8.82E-11	mg/m ³	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls	2.41E+00	mg/kg	1.05E-04	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	5.15E-07	2.94E-07	mg/m ³	NA	NA	NA
				Aldrin	2.59E+02	mg/kg	3.09E-02	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	1.76E-05	8.66E-05	mg/m ³	NA	NA	NA
				Aroclor 1254	6.20E-01	mg/kg	5.50E-05	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	3.13E-08	1.54E-07	mg/m ³	NA	NA	NA
				Delta-BHC	3.21E-01	mg/kg	1.93E-08	µg/m ³	5.10E-04	(µg/m ³) ⁻¹	9.83E-12	5.40E-11	mg/m ³	NA	NA	NA
				Dieldrin	2.57E+00	mg/kg	1.54E-07	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	7.10E-10	4.32E-10	mg/m ³	NA	NA	NA
				Gamma-Chlordane	1.17E+00	mg/kg	7.02E-08	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	7.02E-12	1.97E-10	mg/m ³	7.00E-04	mg/m ³	2.81E-07
				Heptachlor	4.43E+00	mg/kg	6.90E-04	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	8.98E-07	1.93E-06	mg/m ³	NA	NA	NA
				Heptachlor Epoxide	1.14E+00	mg/kg	1.01E-04	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	2.62E-07	2.82E-07	mg/m ³	NA	NA	NA
				Inorganics	3.04E+00	mg/kg	1.82E-07	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	7.84E-10	5.11E-10	mg/m ³	1.50E-05	mg/m ³	3.40E-05
				Arsenic	7.58E+01	mg/kg	4.55E-06	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	5.45E-08	1.27E-08	mg/m ³	1.00E-04	mg/m ³	1.27E-04
				Chromium	1.41E+03	mg/kg	8.48E-05	µg/m ³	NA	NA	NA	2.37E-07	mg/m ³	5.00E-05	mg/m ³	4.75E-03
				Manganese												
			Exp. Route Total								1.94E-05					5.04E-03
			Exposure Point Total								3.19E-04					1.78E+01

NA = not applicable

RID = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

TABLE B-7.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation								
					Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RID/RIC		Hazard Quotient						
					Value	Unit	Value	Unit		Value	Unit	Value	Unit							
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatile Organic Compounds	2.80E-03	mg/kg	1.10E-10	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	5.04E-12	9.60E-10	mg/kg-day	5.00E-04	mg/kg-day	1.92E-06				
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	1.33E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	9.68E-08	1.16E-07	mg/kg-day	NA	NA	NA				
				Pesticides/Polychlorinated Biphenyls	5.25E-01	mg/kg	2.06E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	1.50E-08	1.80E-07	mg/kg-day	NA	NA	NA				
				Aldrin	2.41E+00	mg/kg	9.44E-08	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	1.60E-06	8.26E-07	mg/kg-day	3.00E-05	mg/kg-day	2.75E-02				
				Aroclor 1248	2.59E+02	mg/kg	1.01E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	2.03E-05	8.87E-05	mg/kg-day	2.00E-05	mg/kg-day	4.43E+00				
				Aroclor 1254	6.20E-01	mg/kg	2.43E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.85E-08	2.12E-07	mg/kg-day	2.00E-05	mg/kg-day	1.06E-02				
				Delta-BHC	3.21E-01	mg/kg	1.26E-08	mg/kg-day	1.80E+00	(mg/kg-day) ⁻¹	2.26E-08	1.10E-07	mg/kg-day	NA	NA	NA				
				Dieldrin	2.57E+00	mg/kg	1.01E-07	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	1.61E-06	8.82E-07	mg/kg-day	5.00E-05	mg/kg-day	1.76E-02				
				Gamma-Chlordane	1.17E+00	mg/kg	4.58E-08	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	1.60E-08	4.01E-07	mg/kg-day	5.00E-04	mg/kg-day	8.02E-04				
				Heptachlor	4.43E+00	mg/kg	1.73E-07	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	7.80E-07	1.52E-06	mg/kg-day	5.00E-04	mg/kg-day	3.03E-03				
				Heptachlor Epoxide	1.14E+00	mg/kg	4.45E-08	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	4.05E-07	3.89E-07	mg/kg-day	1.30E-05	mg/kg-day	3.00E-02				
				Inorganics																
				Arsenic	3.04E+00	mg/kg	7.14E-08	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	1.07E-07	6.25E-07	mg/kg-day	3.00E-04	mg/kg-day	2.08E-03				
				Chromium	7.58E+01	mg/kg	2.97E-06	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	1.48E-06	2.60E-05	mg/kg-day	3.00E-03	mg/kg-day	8.66E-03				
				Manganese	1.41E+03	mg/kg	5.53E-05	mg/kg-day	NA	NA	NA	4.84E-04	mg/kg-day	1.40E-01	mg/kg-day	3.46E-03				
				Exp. Route Total											2.65E-05			4.54E+00		
				Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatile Organic Compounds	2.80E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
								Semi-volatile Organic Compounds	3.39E-01	mg/kg	2.08E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	1.52E-07	1.82E-07	mg/kg-day	NA	NA	NA
								Pesticides/Polychlorinated Biphenyls	5.25E-01	mg/kg	3.23E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	2.35E-08	2.82E-07	mg/kg-day	NA	NA	NA
								Aldrin	2.41E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA
Aroclor 1248	2.59E+02	mg/kg	1.71E-05					mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	3.42E-05	1.50E-04	mg/kg-day	2.00E-05	mg/kg-day	7.49E+00				
Aroclor 1254	6.20E-01	mg/kg	4.10E-08					mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	8.20E-08	3.59E-07	mg/kg-day	2.00E-05	mg/kg-day	1.79E-02				
Delta-BHC	3.21E-01	mg/kg	NA					NA	1.80E+00	(mg/kg-day) ⁻¹	NA	NA	NA	NA	NA	NA				
Dieldrin	2.57E+00	mg/kg	NA					NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA				
Gamma-Chlordane	1.17E+00	mg/kg	NA					NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA				
Heptachlor	4.43E+00	mg/kg	NA					NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA				
Heptachlor Epoxide	1.14E+00	mg/kg	NA					NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA				
Inorganics																				
Arsenic	3.04E+00	mg/kg	4.31E-08					mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	6.46E-08	3.77E-07	mg/kg-day	3.00E-04	mg/kg-day	1.26E-03				
Chromium	7.58E+01	mg/kg	NA					NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA				
Manganese	1.41E+03	mg/kg	NA					NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA				
Exp. Route Total											3.46E-05			7.51E+00						
Surface Soil	Surface Soil	Surface Soil	Inhalation					Volatile Organic Compounds	2.80E-03	mg/kg	3.03E-06	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	1.24E-11	1.16E-06	mg/m ³	2.00E-03	mg/m ³	5.82E-04
								Semi-volatile Organic Compounds	3.39E-01	mg/kg	6.50E-10	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	7.15E-13	2.49E-10	mg/m ³	NA	NA	NA
								Pesticides/Polychlorinated Biphenyls	5.25E-01	mg/kg	1.01E-09	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	1.11E-13	3.86E-10	mg/m ³	NA	NA	NA
								Aldrin	2.41E+00	mg/kg	3.36E-06	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	1.65E-08	1.29E-06	mg/m ³	NA	NA	NA
				Aroclor 1248	2.59E+02	mg/kg	9.90E-04	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	5.64E-07	3.79E-04	mg/m ³	NA	NA	NA				
				Aroclor 1254	6.20E-01	mg/kg	1.76E-06	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	1.00E-09	6.74E-07	mg/m ³	NA	NA	NA				
				Delta-BHC	3.21E-01	mg/kg	6.17E-10	µg/m ³	5.10E-04	(µg/m ³) ⁻¹	3.14E-13	2.36E-10	mg/m ³	NA	NA	NA				
				Dieldrin	2.57E+00	mg/kg	4.94E-09	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	2.27E-11	1.89E-09	mg/m ³	NA	NA	NA				
				Gamma-Chlordane	1.17E+00	mg/kg	2.25E-09	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	2.25E-13	8.61E-10	mg/m ³	2.00E-04	mg/m ³	4.31E-06				
				Heptachlor	4.43E+00	mg/kg	2.21E-05	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	2.87E-08	8.47E-06	mg/m ³	NA	NA	NA				
				Heptachlor Epoxide	1.14E+00	mg/kg	3.23E-06	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	8.39E-09	1.24E-06	mg/m ³	NA	NA	NA				
				Inorganics																
				Arsenic	3.04E+00	mg/kg	5.83E-09	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	2.51E-11	2.24E-09	mg/m ³	2.00E-04	mg/m ³	1.12E-05				
				Chromium	7.58E+01	mg/kg	1.45E-07	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	1.75E-09	5.58E-08	mg/m ³	3.00E-04	mg/m ³	1.86E-04				
				Manganese	1.41E+03	mg/kg	2.71E-06	µg/m ³	NA	NA	NA	1.04E-06	mg/m ³	1.70E-04	mg/m ³	6.12E-03				
				Exp. Route Total											6.21E-07			6.90E-03		
				Exposure Point Total											6.16E-05			1.21E+01		

NA = not applicable

RID = reference dose

mg/kg = milligram per kilogram
 mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter
 mg/m³ = milligram per cubic meter

**TABLE B-7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Construction/Utility Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation										
					Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RfD/RfC		Hazard Quotient								
					Value	Unit	Value	Unit		Value	Unit	Value	Unit									
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Surface/ Subsurface Soil	Ingestion	Volatile Organic Compounds																		
				Trichloroethene	3.51E-03	mg/kg	5.66E-11	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	2.60E-12	3.96E-09	mg/kg-day	5.00E-04	mg/kg-day	7.93E-06						
				Semi-volatile Organic Compounds																		
				Benzo(a)anthracene	2.22E-01	mg/kg	3.59E-09	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	2.62E-09	2.51E-07	mg/kg-day	NA	NA	NA	NA					
				Benzo(a)pyrene	2.33E-01	mg/kg	3.77E-09	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	2.75E-08	2.64E-07	mg/kg-day	NA	NA	NA	NA					
				Benzo(b)fluoranthene	4.68E-01	mg/kg	7.56E-09	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	5.52E-09	5.29E-07	mg/kg-day	NA	NA	NA	NA					
				Pesticides/Polychlorinated Biphenyl																		
				4,4'-DDE	3.54E+00	mg/kg	5.72E-08	mg/kg-day	3.40E-01	(mg/kg-day) ⁻¹	1.94E-08	4.00E-06	mg/kg-day	NA	NA	NA	NA					
				4,4'-DDT	2.10E+00	mg/kg	3.39E-08	mg/kg-day	3.40E-01	(mg/kg-day) ⁻¹	1.15E-08	2.37E-06	mg/kg-day	5.00E-04	mg/kg-day	4.74E-03						
				Aldrin	5.28E+00	mg/kg	8.53E-08	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	1.45E-06	5.97E-06	mg/kg-day	3.00E-05	mg/kg-day	1.99E-01						
				Alpha-Chlordane	1.44E+00	mg/kg	2.32E-08	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	8.11E-09	1.62E-06	mg/kg-day	5.00E-04	mg/kg-day	3.25E-03						
				Aroclor 1248	3.19E+02	mg/kg	5.15E-06	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.03E-05	3.61E-04	mg/kg-day	2.00E-05	mg/kg-day	1.80E+01						
				Aroclor 1254	1.31E+00	mg/kg	2.12E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.24E-08	1.49E-06	mg/kg-day	2.00E-05	mg/kg-day	7.43E-02						
				Delta-BHC	1.98E-01	mg/kg	3.19E-09	mg/kg-day	1.80E+00	(mg/kg-day) ⁻¹	5.75E-09	2.24E-07	mg/kg-day	NA	NA	NA						
				Dieldrin	5.84E+00	mg/kg	9.44E-08	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	1.51E-06	6.60E-06	mg/kg-day	5.00E-05	mg/kg-day	1.32E-01						
				Gamma-Chlordane	2.55E+00	mg/kg	4.12E-08	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	1.44E-08	2.88E-06	mg/kg-day	5.00E-04	mg/kg-day	5.77E-03						
				Heptachlor	5.49E+00	mg/kg	8.86E-08	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	3.99E-07	6.20E-06	mg/kg-day	5.00E-04	mg/kg-day	1.24E-02						
				Heptachlor Epoxide	3.63E-01	mg/kg	5.86E-09	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	5.33E-08	4.10E-07	mg/kg-day	1.30E-05	mg/kg-day	3.16E-02						
				Inorganics																		
				Arsenic	2.99E+00	mg/kg	2.90E-08	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	4.34E-08	2.03E-06	mg/kg-day	3.00E-04	mg/kg-day	6.76E-03						
				Chromium	4.45E+01	mg/kg	7.19E-07	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	3.59E-07	5.03E-05	mg/kg-day	3.00E-03	mg/kg-day	1.68E-02						
Iron	2.98E+04	mg/kg	4.80E-04	mg/kg-day	NA	NA	NA	3.36E-02	mg/kg-day	7.00E-01	mg/kg-day	4.80E-02										
Manganese	7.90E+02	mg/kg	1.27E-05	mg/kg-day	NA	NA	NA	8.92E-04	mg/kg-day	1.40E-01	mg/kg-day	6.37E-03										
Exp. Route Total																				1.86E+01		
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Surface/ Subsurface Soil	Dermal Contact	Volatile Organic Compounds																		
				Trichloroethene	3.51E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA						
				Semi-volatile Organic Compounds																		
				Benzo(a)anthracene	2.22E-01	mg/kg	1.47E-09	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	1.07E-09	1.03E-07	mg/kg-day	NA	NA	NA						
				Benzo(a)pyrene	2.33E-01	mg/kg	1.55E-09	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	1.13E-08	1.08E-07	mg/kg-day	NA	NA	NA						
				Benzo(b)fluoranthene	4.68E-01	mg/kg	3.10E-09	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	2.26E-09	2.17E-07	mg/kg-day	NA	NA	NA						
				Pesticides/Polychlorinated Biphenyl																		
				4,4'-DDE	3.54E+00	mg/kg	NA	NA	3.40E-01	(mg/kg-day) ⁻¹	NA	NA	NA	NA	NA	NA						
				4,4'-DDT	2.10E+00	mg/kg	3.20E-09	mg/kg-day	3.40E-01	(mg/kg-day) ⁻¹	1.09E-09	2.24E-07	mg/kg-day	5.00E-04	mg/kg-day	4.49E-04						
				Aldrin	5.28E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA						
				Alpha-Chlordane	1.44E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA						
				Aroclor 1248	3.19E+02	mg/kg	2.28E-06	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.55E-06	1.59E-04	mg/kg-day	2.00E-05	mg/kg-day	7.97E+00						
				Aroclor 1254	1.31E+00	mg/kg	9.37E-09	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.87E-08	6.56E-07	mg/kg-day	2.00E-05	mg/kg-day	3.28E-02						
				Delta-BHC	1.98E-01	mg/kg	NA	NA	1.80E+00	(mg/kg-day) ⁻¹	NA	NA	NA	NA	NA	NA						
				Dieldrin	5.84E+00	mg/kg	NA	NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA						
				Gamma-Chlordane	2.55E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA						
				Heptachlor	5.49E+00	mg/kg	NA	NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA						
				Heptachlor Epoxide	3.63E-01	mg/kg	NA	NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA						
				Inorganics																		
				Arsenic	2.99E+00	mg/kg	4.57E-09	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	6.85E-09	3.20E-07	mg/kg-day	3.00E-04	mg/kg-day	1.07E-03						
				Chromium	4.45E+01	mg/kg	NA	NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA						
Iron	2.98E+04	mg/kg	NA	NA	NA	NA	NA	NA	NA	7.00E-01	mg/kg-day	NA										
Manganese	7.90E+02	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA										
Exp. Route Total																					8.00E+00	

**TABLE B-7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Construction/Utility Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation												
					Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RfD/RfC		Hazard Quotient										
					Value	Unit	Value	Unit		Value	Unit	Value	Unit											
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Surface/ Subsurface Soil	Inhalation	Volatile Organic Compounds																				
				Trichloroethene	3.51E-03	mg/kg	1.90E-06	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	7.79E-12	1.33E-07	mg/m ³	2.00E-03	mg/m ³							6.65E-05		
				Semi-volatile Organic Compounds																				
				Benzo(a)anthracene	2.22E-01	mg/kg	8.28E-08	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	9.10E-12	5.79E-09	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Benzo(a)pyrene	2.33E-01	mg/kg	2.24E-10	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	2.46E-13	1.57E-11	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Benzo(b)fluoranthene	4.68E-01	mg/kg	4.49E-10	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	4.94E-14	3.14E-11	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Pesticides/Polychlorinated Biphenyl																				
				4,4'-DDE	3.54E+00	mg/kg	2.01E-06	µg/m ³	9.70E-05	(µg/m ³) ⁻¹	1.95E-10	1.41E-07	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				4,4'-DDT	2.10E+00	mg/kg	2.01E-09	µg/m ³	9.70E-05	(µg/m ³) ⁻¹	1.95E-13	1.41E-10	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Aldrin	5.28E+00	mg/kg	3.68E-06	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	1.80E-08	2.58E-07	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Alpha-Chlordane	1.44E+00	mg/kg	1.38E-09	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	1.38E-13	9.64E-11	mg/m ³	7.00E-04	mg/m ³	1.38E-07	mg/m ³	1.38E-07	mg/m ³	1.38E-07	mg/m ³	1.38E-07	1.38E-07	
				Aroclor 1248	3.19E+02	mg/kg	6.10E-04	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	3.48E-07	4.27E-05	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Aroclor 1254	1.31E+00	mg/kg	1.86E-06	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	1.06E-09	1.30E-07	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Delta-BHC	1.98E-01	mg/kg	1.90E-10	µg/m ³	5.10E-04	(µg/m ³) ⁻¹	9.68E-14	1.33E-11	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Dieldrin	5.84E+00	mg/kg	5.61E-09	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	2.58E-11	3.92E-10	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Gamma-Chlordane	2.55E+00	mg/kg	2.45E-09	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	2.45E-13	1.71E-10	mg/m ³	7.00E-04	mg/m ³	2.45E-07	mg/m ³	2.45E-07	mg/m ³	2.45E-07	mg/m ³	2.45E-07	2.45E-07	
				Heptachlor	5.49E+00	mg/kg	1.37E-05	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	1.78E-08	9.58E-07	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Heptachlor Epoxide	3.63E-01	mg/kg	5.15E-07	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	1.34E-09	3.61E-08	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Inorganics																				
				Arsenic	2.99E+00	mg/kg	2.87E-09	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	1.23E-11	2.01E-10	mg/m ³	1.50E-05	mg/m ³	1.34E-05	mg/m ³	1.34E-05	mg/m ³	1.34E-05	mg/m ³	1.34E-05	1.34E-05	
				Chromium	4.45E+01	mg/kg	4.27E-08	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	5.12E-10	2.99E-09	mg/m ³	1.00E-04	mg/m ³	2.99E-05	mg/m ³	2.99E-05	mg/m ³	2.99E-05	mg/m ³	2.99E-05	2.99E-05	
				Iron	2.98E+04	mg/kg	2.85E-05	µg/m ³	NA	NA	NA	2.00E-06	mg/m ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
				Manganese	7.90E+02	mg/kg	7.57E-07	µg/m ³	NA	NA	NA	5.30E-08	mg/m ³	5.00E-05	mg/m ³	1.06E-03	mg/m ³	1.06E-03	mg/m ³	1.06E-03	mg/m ³	1.06E-03	1.06E-03	
Exp. Route Total																				1.17E-03				
Exposure Point Total																					2.66E+01			

NA = not applicable

RfD = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

**TABLE B-8
 CALCULATION OF RADIATION CANCER RISKS
 REASONABLE MAXIMUM EXPOSURE**
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	NA
Receptor Population:	NA
Receptor Age:	NA

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	Exposure Point Concentration		Risk Calculation Approach	Cancer Risk Calculation				
					Value	Unit		Intake/Activity		Cancer Slope Factor		Cancer Risk
								Value	Unit	Value	Unit	
NOT APPLICABLE TO THIS SITE												
			Exp. Route Total									
		Exposure Point Total										
								Total of Receptor Risks Across All Media				

There are no radionuclides in this risk assessment. As a result, this table is blank

TABLE B-9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds					Heart/ Immune System/ Developmental/Kidney/Liver					
			Trichloroethene	3E-11	NA	3E-10	3E-10		3.72E-06	NA	1.03E-04	1.07E-04	
			Semi-volatile Organic Compounds						NA	NA	NA	NA	
			Benzo(a)pyrene	1E-06	6E-07	3E-11	2E-06		NA	NA	NA	NA	
			Benzo(b)fluoranthene	2E-07	9E-08	5E-12	3E-07		NA	NA	NA	NA	
			Pesticides/Polychlorinated Biphenyls						Liver	8.24E-02	NA	NA	8.24E-02
			Aldrin	2E-05	NA	6E-07	2E-05		Eyes/Fingers/Toe	1.67E+01	9.71E+00	NA	2.64E+01
			Aroclor 1248	2E-04	1E-04	3E-05	4E-04		Nails/Immune System	3.28E-02	1.91E-02	NA	5.20E-02
			Aroclor 1254	5E-07	3E-07	4E-08	8E-07		Eyes/Fingers/Toe	6.39E-02	NA	NA	6.39E-02
			Dieldrin	2E-05	NA	1E-09	2E-05		Nails/Immune System	2.96E-03	NA	4.15E-07	2.96E-03
			Gamma-Chlordane	2E-07	NA	1E-11	2E-07		Liver	1.21E-02	NA	NA	1.21E-02
			Heptachlor	1E-05	NA	1E-06	1E-05		Liver	1.52E-01	NA	NA	1.52E-01
			Heptachlor Epoxide	6E-06	NA	5E-07	7E-06		Liver	7.58E-03	1.58E-03	4.95E-05	9.20E-03
			Inorganics						Developmental/Cardiovascular System/Nervous System/Lung/Skin	3.02E-02	NA	1.77E-04	3.03E-02
			Arsenic	1E-06	3E-07	1E-09	1E-06		Lung	1.93E-02	NA	1.06E-02	2.99E-02
			Chromium	2E-05	NA	8E-08	2E-05		CNS	1.71E+01	9.73E+00	1.09E-02	2.68E+01
			Manganese	NA	NA	NA	NA						
Chemical Total	3E-04	1E-04	3E-05	5E-04	Chemical Total	1.71E+01	9.73E+00	1.09E-02	2.68E+01				
		Exposure Point Total		5E-04					2.68E+01				
		Exposure Medium Total		5E-04					2.68E+01				
Medium Total				5E-04					2.68E+01				
Receptor Total				5E-04					2.68E+01				

Total Excess Cancer Risk Across All Media = 5E-04

Total Hazard Index Across All Media = 27

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	0.03
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	26
Fingers HI Across All Media =	26
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	26
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.3
Lung HI Across All Media =	0.04
Nervous System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	26

NA = not applicable

CNS = central nervous system

TABLE B-9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface Soil	Surface Soil	Surface Soil	Volatiles Organic Compounds					Heart/ Immune System/ Developmental/Kidney					
			Trichloroethene	4E-12	NA	1E-11	1E-11		1.49E-06	NA	4.51E-04	4.53E-04	
			Semi-volatile Organic Compounds						NA	NA	NA	NA	NA
			Benzo(a)pyrene	1E-07	2E-07	1E-12	3E-07		NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	2E-08	3E-08	2E-13	6E-08		NA	NA	NA	NA	NA
			Pesticides/Polychlorinated Biphenyls						Liver	3.30E-02	NA	NA	3.30E-02
			Aldrin	2E-06	NA	2E-08	2E-06		Eyes/Fingers/Toe	6.66E+00	1.13E+01	NA	1.79E+01
			Aroclor 1248	3E-05	5E-05	8E-07	8E-05		Nails/Immune System	1.31E-02	2.22E-02	NA	3.53E-02
			Aroclor 1254	6E-08	1E-07	1E-09	2E-07		Eyes/Fingers/Toe	1.31E-02	2.22E-02	NA	3.53E-02
			Dieldrin	2E-06	NA	3E-11	2E-06		Nails/Immune System	2.55E-02	NA	NA	2.55E-02
			Gamma-Chlordane	2E-08	NA	3E-13	2E-08		Liver	1.18E-03	NA	6.36E-06	1.19E-03
			Heptachlor	1E-06	NA	5E-08	1E-06		Liver	4.84E-03	NA	NA	4.84E-03
			Heptachlor Epoxide	8E-07	NA	2E-08	8E-07		Liver	6.06E-02	NA	NA	6.06E-02
			Inorganics						Skin/Developmental/Cardiovascular System/Nervous System	3.03E-03	1.83E-03	1.63E-05	4.87E-03
			Arsenic	2E-07	9E-08	4E-11	2E-07		Respiratory System	1.21E-02	NA	2.59E-04	1.23E-02
			Chromium	2E-06	NA	2E-09	2E-06		CNS/Nervous System	7.72E-03	NA	1.37E-02	2.14E-02
			Manganese	NA	NA	NA	NA						
			Chemical Total	4E-05	5E-05	9E-07	9E-05		Chemical Total	6.82E+00	1.13E+01	1.44E-02	1.81E+01
					Exposure Point Total								1.81E+01
					Exposure Medium Total								1.81E+01
Medium Total									1.81E+01				
Receptor Total									1.81E+01				

Total Excess Cancer Risk Across All Media **9E-05**

Total Hazard Index Across All Media **18**

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	0.02
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	18
Fingers HI Across All Media =	18
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	18
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.1
Nervous System HI Across All Media =	0.03
Respiratory System HI Across All Media =	0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	18

NA = not applicable

CNS = central nervous system

TABLE B-9.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
REASONABLE MAXIMUM EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient							
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total			
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds												
			Trichloroethene	4E-11	NA	4E-10	4E-10	Heart/ Immune System/ Developmental/Kidney/Liver	4.80E-06	NA	1.33E-04	1.38E-04			
			Semi-volatile Organic Compounds												
			Benzo(a)pyrene	8E-07	4E-07	2E-11	1E-06	NA	NA	NA	NA	NA			
			Benzo(b)fluoranthene	1E-07	6E-08	3E-12	2E-07	NA	NA	NA	NA	NA			
			Pesticides/Polychlorinated Biphenyls												
			Aldrin	1E-05	NA	5E-07	1E-05	Liver	6.88E-02	NA	NA	6.88E-02			
			Aroclor 1248	2E-04	9E-05	2E-05	3E-04	Eyes/Fingers/Toe Nails/Immune System	1.11E+01	6.46E+00	NA	1.75E+01			
			Aroclor 1254	4E-07	2E-07	3E-08	6E-07	Eyes/Fingers/Toe Nails/Immune System	2.65E-02	1.55E-02	NA	4.20E-02			
			Delta-BHC	2E-07	NA	1E-11	2E-07	NA	NA	NA	NA	NA			
			Dieldrin	1E-05	NA	7E-10	1E-05	Liver	4.41E-02	NA	NA	4.41E-02			
			Gamma-Chlordane	1E-07	NA	7E-12	1E-07	Liver	2.01E-03	NA	2.81E-07	2.01E-03			
			Heptachlor	6E-06	NA	9E-07	7E-06	Liver	7.59E-03	NA	NA	7.59E-03			
			Heptachlor Epoxide	3E-06	NA	3E-07	3E-06	Liver	7.49E-02	NA	NA	7.49E-02			
			Inorganics												
			Arsenic	8E-07	2E-07	8E-10	1E-06	Developmental/Cardiovascular System/Nervous System/Lung/Skin	5.21E-03	1.08E-03	3.40E-05	6.33E-03			
			Chromium	1E-05	NA	5E-08	1E-05	Lung	2.16E-02	NA	1.27E-04	2.18E-02			
Manganese	NA	NA	NA	NA	CNS	8.65E-03	NA	4.75E-03	1.34E-02						
Chemical Total	2E-04	9E-05	2E-05	3E-04	Chemical Total	1.13E+01	6.48E+00	5.04E-03	1.78E+01						
Exposure Point Total				3E-04				1.78E+01							
Exposure Medium Total				3E-04				1.78E+01							
Medium Total				3E-04				1.78E+01							
Receptor Total				3E-04				1.78E+01							

Total Excess Cancer Risk Across All Media **3E-04**

Total Hazard Index Across All Media **18**

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	0.01
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	18
Fingers HI Across All Media =	18
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	18
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.2
Lung HI Across All Media =	0.03
Nervous System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	18

NA = not applicable

CNS = central nervous system

GI = gastrointestinal

TABLE B-9.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
REASONABLE MAXIMUM EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient						
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total		
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds											
			Trichloroethene	5E-12	NA	1E-11	2E-11	Heart/ Immune System/ Developmental/Kidney	1.92E-06	NA	5.82E-04	5.83E-04		
			Semi-volatile Organic Compounds											
			Benzo(a)pyrene	1E-07	2E-07	7E-13	2E-07	NA	NA	NA	NA	NA		
			Benzo(b)fluoranthene	2E-08	2E-08	1E-13	4E-08	NA	NA	NA	NA	NA		
			Pesticides/Polychlorinated Biphenyls											
			Aldrin	2E-06	NA	2E-08	2E-06	Liver	2.75E-02	NA	NA	2.75E-02		
			Aroclor 1248	2E-05	3E-05	6E-07	6E-05	Eyes/Fingers/Toe	4.43E+00	7.49E+00	NA	1.19E+01		
			Aroclor 1254	5E-08	8E-08	1E-09	1E-07	Nails/Immune System	1.06E-02	1.79E-02	NA	2.86E-02		
			Delta-BHC	2E-08	NA	3E-13	2E-08	Eyes/Fingers/Toe	NA	NA	NA	NA		
			Dieldrin	2E-06	NA	2E-11	2E-06	Nails/Immune System	NA	NA	NA	NA		
			Gamma-Chlordane	2E-08	NA	2E-13	2E-08	Liver	1.76E-02	NA	NA	1.76E-02		
			Heptachlor	8E-07	NA	3E-08	8E-07	Liver	8.02E-04	NA	4.31E-06	8.06E-04		
			Heptachlor Epoxide	4E-07	NA	8E-09	4E-07	Liver	3.03E-03	NA	NA	3.03E-03		
			Inorganics											
			Arsenic	1E-07	6E-08	3E-11	2E-07	Liver	3.00E-02	NA	NA	3.00E-02		
			Chromium	1E-06	NA	2E-09	1E-06	Skin/Developmental/Cardiovascular System/Nervous System	2.08E-03	1.26E-03	1.12E-05	3.35E-03		
			Manganese	NA	NA	NA	NA	Respiratory System	8.66E-03	NA	1.86E-04	8.84E-03		
			Chemical Total	3E-05	3E-05	6E-07	6E-05	CNS/Nervous System	3.46E-03	NA	6.12E-03	9.57E-03		
					Exposure Point Total		6E-05	Chemical Total	4.54E+00	7.51E+00	6.90E-03	1.21E+01		
	Exposure Medium Total			6E-05					1.21E+01					
Medium Total				6E-05					1.21E+01					
Receptor Total				6E-05					1.21E+01					

Total Excess Cancer Risk Across All Media 6E-05

Total Hazard Index Across All Media 12

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	<0.01
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	12
Fingers HI Across All Media =	12
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	12
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.08
Nervous System HI Across All Media =	0.01
Respiratory System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	12

NA = not applicable

CNS = central nervous system

GI = gastrointestinal

TABLE B-9.5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Construction/Utility Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Surface/ Subsurface Soil	Volatile Organic Compounds										
			Trichloroethene	3E-12	NA	8E-12	1E-11	Heart/ Immune System/ Developmental/Kidney/Liver	7.93E-06	NA	6.65E-05	7.44E-05	
			Semi-volatile Organic Compounds										
			Benzo(a)anthracene	3E-09	1E-09	9E-12	4E-09	NA	NA	NA	NA	NA	
			Benzo(a)pyrene	3E-08	1E-08	2E-13	4E-08	NA	NA	NA	NA	NA	
			Benzo(b)fluoranthene	6E-09	2E-09	5E-14	8E-09	NA	NA	NA	NA	NA	
			Pesticides/Polychlorinated Biphenyls										
			4,4'-DDE	2E-08	NA	2E-10	2E-08	NA	NA	NA	NA	NA	
			4,4'-DDT	1E-08	1E-09	2E-13	1E-08	Liver	4.74E-03	4.49E-04	NA	5.19E-03	
			Aldrin	1E-06	NA	2E-08	1E-06	Liver	1.99E-01	NA	NA	1.99E-01	
			Alpha-Chlordane	8E-09	NA	1E-13	8E-09	Liver	3.25E-03	NA	1.38E-07	3.25E-03	
			Aroclor 1248	1E-05	5E-06	3E-07	2E-05	Eyes/Fingers/Toe Nails/Immune System	1.80E+01	7.97E+00	NA	2.60E+01	
			Aroclor 1254	4E-08	2E-08	1E-09	6E-08	Eyes/Fingers/Toe Nails/Immune System	7.43E-02	3.28E-02	NA	1.07E-01	
			Delta-BHC	6E-09	NA	1E-13	6E-09	NA	NA	NA	NA	NA	
			Dieldrin	2E-06	NA	3E-11	2E-06	Liver	1.32E-01	NA	NA	1.32E-01	
			Gamma-Chlordane	1E-08	NA	2E-13	1E-08	Liver	5.77E-03	NA	2.45E-07	5.77E-03	
			Heptachlor	4E-07	NA	2E-08	4E-07	Liver	1.24E-02	NA	NA	1.24E-02	
			Heptachlor Epoxide	5E-08	NA	1E-09	5E-08	Liver	3.16E-02	NA	NA	3.16E-02	
			Inorganics										
			Arsenic	4E-08	7E-09	1E-11	5E-08	Developmental/Cardiovascular System/Nervous System/Lung/Skin	6.76E-03	1.07E-03	1.34E-05	7.83E-03	
			Chromium	4E-07	NA	5E-10	4E-07	Lung	1.68E-02	NA	2.99E-05	1.68E-02	
Iron	NA	NA	NA	NA	GI Tract	4.80E-02	NA	NA	4.80E-02				
Manganese	NA	NA	NA	NA	CNS	6.37E-03	NA	1.06E-03	7.43E-03				
Chemical Total	1E-05	5E-06	4E-07	2E-05	Chemical Total	1.86E+01	8.00E+00	1.17E-03	2.66E+01				
		Exposure Point Total		2E-05					2.66E+01				
		Exposure Medium Total		2E-05					2.66E+01				
Medium Total				2E-05					2.66E+01				
Receptor Total				2E-05					2.66E+01				

Total Excess Cancer Risk Across All Media = 2E-05

Total Hazard Index Across All Media = 27

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	<0.01
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	26
Fingers HI Across All Media =	26
GI Tract HI Across All Media =	0.05
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	26
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.4
Lung HI Across All Media =	0.02
Nervous System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	26

NA = not applicable

CNS = central nervous system

GI = gastrointestinal

TABLE B-10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Semi-volatile Organic Compounds					NA	NA	NA	NA	NA
			Benzo(a)pyrene	1E-06	6E-07	3E-11	2E-06	Liver	8.24E-02	NA	NA	8.24E-02
			Pesticides/Polychlorinated Biphenyls					Eyes/Fingers/Toe Nails/Immune System	1.67E+01	9.71E+00	NA	2.64E+01
			Aldrin	2E-05	NA	6E-07	2E-05	Liver	6.39E-02	NA	NA	6.39E-02
			Aroclor 1248	2E-04	1E-04	3E-05	4E-04	Liver	1.21E-02	NA	NA	1.21E-02
			Dieldrin	2E-05	NA	1E-09	2E-05	Liver	1.52E-01	NA	NA	1.52E-01
			Heptachlor	1E-05	NA	1E-06	1E-05	Developmental/Cardiovascular System/Nervous System/Lung/Skin	7.58E-03	1.58E-03	4.95E-05	9.20E-03
			Heptachlor Epoxide	6E-06	NA	5E-07	7E-06	Lung	3.02E-02	NA	1.77E-04	3.03E-02
			Inorganics					Chemical Total	1.71E+01	9.73E+00	1.09E-02	2.68E+01
			Arsenic	1E-06	3E-07	1E-09	1E-06					
Chromium	2E-05	NA	8E-08	2E-05								
Chemical Total	3E-04	1E-04	3E-05	5E-04								
		Exposure Point Total								2.68E+01		
		Exposure Medium Total								2.68E+01		
Medium Total						5E-04				2.68E+01		
Receptor Total						5E-04				2.68E+01		

Total Excess Cancer Risk Across All Media 5E-04

Total Hazard Index Across All Media 27

Eyes HI Across All Media = 26
 Fingers HI Across All Media = 26
 Immune system HI Across All Media = 26
 Toe Nails HI Across All Media = 26

Note:
 Only chemicals above EPA's threshold values are listed in this table

TABLE B-10.2
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient						
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total		
Surface Soil	Surface Soil	Surface Soil	Pesticides/Polychlorinated Biphenyls											
			Aldrin	2E-06	NA	2E-08	2E-06	Liver	3.30E-02	NA	NA	3.30E-02		
			Aroclor 1248	3E-05	5E-05	8E-07	8E-05	Eyes/Fingers/Toe Nails/Immune System	6.66E+00	1.13E+01	NA	1.79E+01		
			Dieldrin	2E-06	NA	3E-11	2E-06	Liver	2.55E-02	NA	NA	2.55E-02		
			Heptachlor	1E-06	NA	5E-08	1E-06	Liver	4.84E-03	NA	NA	4.84E-03		
			Inorganics											
			Chromium	2E-06	NA	2E-09	2E-06	Respiratory System	1.21E-02	NA	2.59E-04	1.23E-02		
Chemical Total	4E-05	5E-05	9E-07	9E-05	Chemical Total	6.82E+00	1.13E+01	1.44E-02	1.81E+01					
		Exposure Point Total										9E-05	1.81E+01	
		Exposure Medium Total										9E-05	1.81E+01	
Medium Total												9E-05	1.81E+01	
Receptor Total												9E-05	1.81E+01	

Total Excess Cancer Risk Across All Media 9E-05

Total Hazard Index Across All Media 18

Eyes HI Across All Media = 18
 Fingers HI Across All Media = 18
 Immune system HI Across All Media = 18
 Toe Nails HI Across All Media = 18

Note:
 Only chemicals above EPA's threshold values are listed in this table

TABLE B-10.3
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Semi-volatile Organic Compounds									
			Benzo(a)pyrene	8E-07	4E-07	2E-11	1E-06	NA	NA	NA	NA	NA
			Pesticides/Polychlorinated Biphenyls									
			Aldrin	1E-05	NA	5E-07	1E-05	Liver	6.88E-02	NA	NA	6.88E-02
			Aroclor 1248	2E-04	9E-05	2E-05	3E-04	Eyes/Fingers/Toe Nails/Immune System	1.11E+01	6.46E+00	NA	1.75E+01
			Dieldrin	1E-05	NA	7E-10	1E-05	Liver	4.41E-02	NA	NA	4.41E-02
			Heptachlor	6E-06	NA	9E-07	7E-06	Liver	7.59E-03	NA	NA	7.59E-03
			Heptachlor Epoxide	3E-06	NA	3E-07	3E-06	Liver	7.49E-02	NA	NA	7.49E-02
			Inorganics									
			Arsenic	8E-07	2E-07	8E-10	1E-06	Developmental/Cardiovascular System/Nervous System/Lung/Skin	5.21E-03	1.08E-03	3.40E-05	6.33E-03
			Chromium	1E-05	NA	5E-08	1E-05	Lung	2.16E-02	NA	1.27E-04	2.18E-02
			Chemical Total	2E-04	9E-05	2E-05	3E-04	Chemical Total	1.13E+01	6.48E+00	5.04E-03	1.78E+01
		Exposure Point Total								1.78E+01		
		Exposure Medium Total								1.78E+01		
Medium Total										1.78E+01		
Receptor Total										1.78E+01		

Total Excess Cancer Risk Across All Media 3E-04

Total Hazard Index Across All Media 18

Eyes HI Across All Media = 18
 Fingers HI Across All Media = 18
 Immune system HI Across All Media = 18
 Toe Nails HI Across All Media = 18

NA = not applicable CNS = central nervous system
 Note:
 Only chemicals above EPA's threshold values are listed in this table

TABLE B-10.4
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface Soil	Surface Soil	Surface Soil	Pesticides/Polychlorinated Biphenyls										
			Aldrin	2E-06	NA	2E-08	2E-06	Liver	2.75E-02	NA	NA	2.75E-02	
			Aroclor 1248	2E-05	3E-05	6E-07	6E-05	Eyes/Fingers/Toe	4.43E+00	7.49E+00	NA	1.19E+01	
			Dieldrin	2E-06	NA	2E-11	2E-06	Nails/Immune System	1.76E-02	NA	NA	1.76E-02	
			Inorganics					Liver					
			Chromium	1E-06	NA	2E-09	1E-06	Respiratory System	8.66E-03	NA	1.86E-04	8.84E-03	
			Chemical Total	3E-05	3E-05	6E-07	6E-05	Chemical Total	4.54E+00	7.51E+00	6.90E-03	1.21E+01	
		Exposure Point Total								6E-05			1.21E+01
		Exposure Medium Total								6E-05			1.21E+01
Medium Total							6E-05						1.21E+01
Receptor Total							6E-05						1.21E+01

Total Excess Cancer Risk Across All Media 6E-05

Total Hazard Index Across All Media 12

Eyes HI Across All Media = 12
 Fingers HI Across All Media = 12
 Immune system HI Across All Media = 12
 Toe Nails HI Across All Media = 12

NA = not applicable

Note:

Only chemicals above EPA's threshold values are listed in this table

TABLE B-10.5
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

Scenario Timeframe:	Current/Future
Receptor Population:	Construction/Utility Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface/ Subsurface Soil	Surface/ Subsurface Soil	Surface/ Subsurface Soil	Pesticides/Polychlorinated Biphenyls										
			Aldrin	1E-06	NA	2E-08	1E-06	Liver	1.99E-01	NA	NA	1.99E-01	
			Aroclor 1248	1E-05	5E-06	3E-07	2E-05	Eyes/Fingers/Toe	1.80E+01	7.97E+00	NA	2.60E+01	
			Dieldrin	2E-06	NA	3E-11	2E-06	Nails/Immune System					
			Chemical Total	1E-05	5E-06	4E-07	2E-05	Liver	1.32E-01	NA	NA	1.32E-01	
			Exposure Point Total				2E-05					2.66E+01	
			Exposure Medium Total				2E-05					2.66E+01	
Medium Total							2E-05					2.66E+01	
Receptor Total							2E-05					2.66E+01	

Total Excess Cancer Risk Across All Media 2E-05

Total Hazard Index Across All Media 27

Eyes HI Across All Media = 26
 Fingers HI Across All Media = 26
 Immune system HI Across All Media = 26
 Toe Nails HI Across All Media = 26

NA = not applicable

Note:

Only chemicals above EPA's threshold values are listed in this table

Appendix C

ProUCL Output for Chemicals of Potential Concern

Appendix C-1 ProUCL Output - Surface Soil (Current Scenario)

Appendix C-2 ProUCL Output - Surface Soil (Future Scenario)

Appendix C-3 ProUCL Output - Surface/Subsurface Soil

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Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options
Date/Time of Computation 2/8/2016 7:47:35 PM
From File ProUCL_Input.xls
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

Trichloroethene

General Statistics

Total Number of Observations	48	Number of Distinct Observations	33
Number of Detects	8	Number of Non-Detects	40
Number of Distinct Detects	7	Number of Distinct Non-Detects	26
Minimum Detect	0.71	Minimum Non-Detect	3.2
Maximum Detect	3.3	Maximum Non-Detect	14
Variance Detects	0.789	Percent Non-Detects	83.33%
Mean Detects	1.698	SD Detects	0.888
Median Detects	1.35	CV Detects	0.523
Skewness Detects	0.987	Kurtosis Detects	-8.367E-4
Mean of Logged Detects	0.415	SD of Logged Detects	0.51

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.896	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.256	Lilliefors GOF Test
5% Lilliefors Critical Value	0.313	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1.672	Standard Error of Mean	0.3
SD	0.812	95% KM (BCA) UCL	2.225
95% KM (t) UCL	2.175	95% KM (Percentile Bootstrap) UCL	2.158
95% KM (z) UCL	2.165	95% KM Bootstrap t UCL	2.587
90% KM Chebyshev UCL	2.571	95% KM Chebyshev UCL	2.978
97.5% KM Chebyshev UCL	3.543	99% KM Chebyshev UCL	4.653

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.296	Anderson-Darling GOF Test
5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.527	k star (bias corrected MLE)	2.913
Theta hat (MLE)	0.375	Theta star (bias corrected MLE)	0.583
nu hat (MLE)	72.43	nu star (bias corrected)	46.6
MLE Mean (bias corrected)	1.698	MLE Sd (bias corrected)	0.995

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	4.237	nu hat (KM)	406.7
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Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Approximate Chi Square Value (406.71, α)	361	Adjusted Chi Square Value (406.71, β)	359.6
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1.884	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1.891

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.71	Mean	1.592
Maximum	3.3	Median	1.552
SD	0.476	CV	0.299
k hat (MLE)	12.32	k star (bias corrected MLE)	11.57
Theta hat (MLE)	0.129	Theta star (bias corrected MLE)	0.138
nu hat (MLE)	1183	nu star (bias corrected)	1110
MLE Mean (bias corrected)	1.592	MLE Sd (bias corrected)	0.468
		Adjusted Level of Significance (β)	0.045
Approximate Chi Square Value (N/A, α)	1034	Adjusted Chi Square Value (N/A, β)	1032
95% Gamma Approximate UCL (use when $n \geq 50$)	1.71	95% Gamma Adjusted UCL (use when $n < 50$)	1.713

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.965	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.186	Lilliefors GOF Test
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.539	Mean in Log Scale	0.391
SD in Original Scale	0.467	SD in Log Scale	0.282
95% t UCL (assumes normality of ROS data)	1.653	95% Percentile Bootstrap UCL	1.655
95% BCA Bootstrap UCL	1.668	95% Bootstrap t UCL	1.669
95% H-UCL (Log ROS)	1.657		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.402	95% H-UCL (KM -Log)	1.898
KM SD (logged)	0.47	95% Critical H Value (KM-Log)	1.866
KM Standard Error of Mean (logged)	0.175		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.709	Mean in Log Scale	0.92
SD in Original Scale	1.105	SD in Log Scale	0.404
95% t UCL (Assumes normality)	2.976	95% H-Stat UCL	3.032

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.175	95% KM (Percentile Bootstrap) UCL	2.158
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
 However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics

Total Number of Observations	46	Number of Distinct Observations	36
		Number of Missing Observations	2
Number of Detects	36	Number of Non-Detects	10
Number of Distinct Detects	33	Number of Distinct Non-Detects	3
Minimum Detect	9.3	Minimum Non-Detect	180
Maximum Detect	2400	Maximum Non-Detect	200
Variance Detects	239747	Percent Non-Detects	21.74%
Mean Detects	235.5	SD Detects	489.6
Median Detects	40.5	CV Detects	2.08
Skewness Detects	3.218	Kurtosis Detects	11.39
Mean of Logged Detects	4.161	SD of Logged Detects	1.485

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.518	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.387	Lilliefors GOF Test
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	193	Standard Error of Mean	65.05
SD	434.8	95% KM (BCA) UCL	320.7
95% KM (t) UCL	302.3	95% KM (Percentile Bootstrap) UCL	314.6
95% KM (z) UCL	300	95% KM Bootstrap t UCL	406.2
90% KM Chebyshev UCL	388.2	95% KM Chebyshev UCL	476.6
97.5% KM Chebyshev UCL	599.3	99% KM Chebyshev UCL	840.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.413	Anderson-Darling GOF Test
5% A-D Critical Value	0.815	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.288	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.155	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)	0.49	k star (bias corrected MLE)	0.468
Theta hat (MLE)	480.4	Theta star (bias corrected MLE)	503.3
nu hat (MLE)	35.29	nu star (bias corrected)	33.68
MLE Mean (bias corrected)	235.5	MLE Sd (bias corrected)	344.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.197	nu hat (KM)	18.13
Approximate Chi Square Value (18.13, α)	9.484	Adjusted Chi Square Value (18.13, β)	9.281
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	368.9	95% Gamma Adjusted KM-UCL (use when $n < 50$)	377

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	194.6
Maximum	2400	Median	38
SD	440.4	CV	2.262
k hat (MLE)	0.308	k star (bias corrected MLE)	0.303
Theta hat (MLE)	631.7	Theta star (bias corrected MLE)	643.4
nu hat (MLE)	28.35	nu star (bias corrected)	27.83
MLE Mean (bias corrected)	194.6	MLE Sd (bias corrected)	353.9
		Adjusted Level of Significance (β)	0.0448
Approximate Chi Square Value (27.83, α)	16.8	Adjusted Chi Square Value (27.83, β)	16.52
95% Gamma Approximate UCL (use when n>=50)	322.5	95% Gamma Adjusted UCL (use when n<50)	327.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.892	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	Lilliefors GOF Test
5% Lilliefors Critical Value	0.148	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	195.2	Mean in Log Scale	4.054
SD in Original Scale	439	SD in Log Scale	1.37
95% t UCL (assumes normality of ROS data)	303.9	95% Percentile Bootstrap UCL	310.1
95% BCA Bootstrap UCL	349.8	95% Bootstrap t UCL	401.6
95% H-UCL (Log ROS)	258.5		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	204.5	Mean in Log Scale	4.242
SD in Original Scale	435.9	SD in Log Scale	1.319
95% t UCL (Assumes normality)	312.4	95% H-Stat UCL	281.6

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 476.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	47	Number of Distinct Observations	39
		Number of Missing Observations	1
Number of Detects	42	Number of Non-Detects	5
Number of Distinct Detects	38	Number of Distinct Non-Detects	2

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Minimum Detect	17	Minimum Non-Detect	180
Maximum Detect	3500	Maximum Non-Detect	190
Variance Detects	555021	Percent Non-Detects	10.64%
Mean Detects	342.6	SD Detects	745
Median Detects	70	CV Detects	2.174
Skewness Detects	3.331	Kurtosis Detects	11.36
Mean of Logged Detects	4.598	SD of Logged Detects	1.389

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.474	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.396	Lilliefors GOF Test
5% Lilliefors Critical Value	0.137	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	313.2	Standard Error of Mean	103.5
SD	701.2	95% KM (BCA) UCL	505.4
95% KM (t) UCL	487	95% KM (Percentile Bootstrap) UCL	494.7
95% KM (z) UCL	483.5	95% KM Bootstrap t UCL	683.6
90% KM Chebyshev UCL	623.8	95% KM Chebyshev UCL	764.5
97.5% KM Chebyshev UCL	959.8	99% KM Chebyshev UCL	1343

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.465	Anderson-Darling GOF Test
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.284	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.144	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)	0.511	k star (bias corrected MLE)	0.49
Theta hat (MLE)	670.4	Theta star (bias corrected MLE)	698.6
nu hat (MLE)	42.93	nu star (bias corrected)	41.2
MLE Mean (bias corrected)	342.6	MLE Sd (bias corrected)	489.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.199	nu hat (KM)	18.75
Approximate Chi Square Value (18.75, α)	9.935	Adjusted Chi Square Value (18.75, β)	9.731
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	591	95% Gamma Adjusted KM-UCL (use when $n < 50$)	603.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	312.6
Maximum	3500	Median	67
SD	709.6	CV	2.27
k hat (MLE)	0.382	k star (bias corrected MLE)	0.372
Theta hat (MLE)	818.1	Theta star (bias corrected MLE)	840.6
nu hat (MLE)	35.92	nu star (bias corrected)	34.96
MLE Mean (bias corrected)	312.6	MLE Sd (bias corrected)	512.6

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Approximate Chi Square Value (34.96, α)	22.44	Adjusted Level of Significance (β)	0.0449
95% Gamma Approximate UCL (use when $n \geq 50$)	487.2	Adjusted Chi Square Value (34.96, β)	22.12
		95% Gamma Adjusted UCL (use when $n < 50$)	494.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.839	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.191	Lilliefors GOF Test
5% Lilliefors Critical Value	0.137	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	314.5	Mean in Log Scale	4.554
SD in Original Scale	708.3	SD in Log Scale	1.333
95% t UCL (assumes normality of ROS data)	487.9	95% Percentile Bootstrap UCL	492
95% BCA Bootstrap UCL	547.7	95% Bootstrap t UCL	669
95% H-UCL (Log ROS)	393.7		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	315.9	Mean in Log Scale	4.589
SD in Original Scale	707.7	SD in Log Scale	1.312
95% t UCL (Assumes normality)	489.2	95% H-Stat UCL	391

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 764.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aldrin

General Statistics

Total Number of Observations	46	Number of Distinct Observations	32
		Number of Missing Observations	2
Number of Detects	31	Number of Non-Detects	15
Number of Distinct Detects	27	Number of Distinct Non-Detects	6
Minimum Detect	1.1	Minimum Non-Detect	1.8
Maximum Detect	21000	Maximum Non-Detect	4.1
Variance Detects	13878485	Percent Non-Detects	32.61%
Mean Detects	1218	SD Detects	3725
Median Detects	230	CV Detects	3.06
Skewness Detects	5.319	Kurtosis Detects	29.06
Mean of Logged Detects	5.286	SD of Logged Detects	2.225

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.31	Shapiro Wilk GOF Test
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Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

5% Shapiro Wilk Critical Value	0.929	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.385	Lilliefors GOF Test
5% Lilliefors Critical Value	0.159	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	820.9	Standard Error of Mean	458.9
SD	3062	95% KM (BCA) UCL	1732
95% KM (t) UCL	1592	95% KM (Percentile Bootstrap) UCL	1685
95% KM (z) UCL	1576	95% KM Bootstrap t UCL	4274
90% KM Chebyshev UCL	2198	95% KM Chebyshev UCL	2821
97.5% KM Chebyshev UCL	3687	99% KM Chebyshev UCL	5387

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.995	Anderson-Darling GOF Test
5% A-D Critical Value	0.839	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.162	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.17	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.367	k star (bias corrected MLE)	0.353
Theta hat (MLE)	3318	Theta star (bias corrected MLE)	3450
nu hat (MLE)	22.75	nu star (bias corrected)	21.88
MLE Mean (bias corrected)	1218	MLE Sd (bias corrected)	2050

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0719	nu hat (KM)	6.613
Approximate Chi Square Value (6.61, α)	1.96	Adjusted Chi Square Value (6.61, β)	1.88
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	2769	95% Gamma Adjusted KM-UCL (use when $n < 50$)	2888

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	820.6
Maximum	21000	Median	62.5
SD	3096	CV	3.773
k hat (MLE)	0.163	k star (bias corrected MLE)	0.167
Theta hat (MLE)	5026	Theta star (bias corrected MLE)	4910
nu hat (MLE)	15.02	nu star (bias corrected)	15.37
MLE Mean (bias corrected)	820.6	MLE Sd (bias corrected)	2007
		Adjusted Level of Significance (β)	0.0448
Approximate Chi Square Value (15.37, α)	7.522	Adjusted Chi Square Value (15.37, β)	7.344
95% Gamma Approximate UCL (use when $n \geq 50$)	1677	95% Gamma Adjusted UCL (use when $n < 50$)	1718

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.953	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.929	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.128	Lilliefors GOF Test
5% Lilliefors Critical Value	0.159	Detected Data appear Lognormal at 5% Significance Level

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	821.5	Mean in Log Scale	3.798
SD in Original Scale	3096	SD in Log Scale	2.874
95% t UCL (assumes normality of ROS data)	1588	95% Percentile Bootstrap UCL	1719
95% BCA Bootstrap UCL	2306	95% Bootstrap t UCL	4195
95% H-UCL (Log ROS)	22038		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.609	95% H-UCL (KM -Log)	32587
KM SD (logged)	3.008	95% Critical H Value (KM-Log)	5.035
KM Standard Error of Mean (logged)	0.451		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	820.9
SD in Original Scale	3096
95% t UCL (Assumes normality)	1588

DL/2 Log-Transformed

Mean in Log Scale	3.581
SD in Log Scale	3.077
95% H-Stat UCL	42996

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	1732	95% GROS Adjusted Gamma UCL	1718
95% Adjusted Gamma KM-UCL	2888		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aroclor 1248

General Statistics

Total Number of Observations	48	Number of Distinct Observations	42
Number of Detects	44	Number of Non-Detects	4
Number of Distinct Detects	39	Number of Distinct Non-Detects	3
Minimum Detect	110	Minimum Non-Detect	36
Maximum Detect	2300000	Maximum Non-Detect	38
Variance Detects	1.199E+11	Percent Non-Detects	8.333%
Mean Detects	97378	SD Detects	346227
Median Detects	19000	CV Detects	3.556
Skewness Detects	6.269	Kurtosis Detects	40.59
Mean of Logged Detects	9.699	SD of Logged Detects	1.974

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.274	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.944	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.389	Lilliefors GOF Test
5% Lilliefors Critical Value	0.134	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	89266	Standard Error of Mean	48007
SD	328801	95% KM (BCA) UCL	186730
95% KM (t) UCL	169818	95% KM (Percentile Bootstrap) UCL	183008
95% KM (z) UCL	168230	95% KM Bootstrap t UCL	476480
90% KM Chebyshev UCL	233287	95% KM Chebyshev UCL	298524
97.5% KM Chebyshev UCL	389070	99% KM Chebyshev UCL	566930

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.03	Anderson-Darling GOF Test
5% A-D Critical Value	0.844	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.189	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.143	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)	0.372	k star (bias corrected MLE)	0.362
Theta hat (MLE)	261502	Theta star (bias corrected MLE)	268895
nu hat (MLE)	32.77	nu star (bias corrected)	31.87
MLE Mean (bias corrected)	97378	MLE Sd (bias corrected)	161816

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0737	nu hat (KM)	7.076
Approximate Chi Square Value (7.08, α)	2.212	Adjusted Chi Square Value (7.08, β)	2.129
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	285515	95% Gamma Adjusted KM-UCL (use when $n < 50$)	296677

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	89263
Maximum	2300000	Median	16500
SD	332281	CV	3.723
k hat (MLE)	0.246	k star (bias corrected MLE)	0.245
Theta hat (MLE)	362619	Theta star (bias corrected MLE)	364837
nu hat (MLE)	23.63	nu star (bias corrected)	23.49
MLE Mean (bias corrected)	89263	MLE Sd (bias corrected)	180462
		Adjusted Level of Significance (β)	0.045
Approximate Chi Square Value (23.49, α)	13.46	Adjusted Chi Square Value (23.49, β)	13.22
95% Gamma Approximate UCL (use when $n \geq 50$)	155767	95% Gamma Adjusted UCL (use when $n < 50$)	158546

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.979	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.944	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0765	Lilliefors GOF Test
5% Lilliefors Critical Value	0.134	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	89280	Mean in Log Scale	9.329
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Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

SD in Original Scale	332277	SD in Log Scale	2.259
95% t UCL (assumes normality of ROS data)	169753	95% Percentile Bootstrap UCL	183874
95% BCA Bootstrap UCL	241263	95% Bootstrap t UCL	477902
95% H-UCL (Log ROS)	533825		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	9.189	95% H-UCL (KM -Log)	1152610
KM SD (logged)	2.519	95% Critical H Value (KM-Log)	4.342
KM Standard Error of Mean (logged)	0.368		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	89264
SD in Original Scale	332281
95% t UCL (Assumes normality)	169739

DL/2 Log-Transformed

Mean in Log Scale	9.134
SD in Log Scale	2.673
95% H-Stat UCL	1956237

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 389070

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aroclor 1254

General Statistics

Total Number of Observations	48	Number of Distinct Observations	27
Number of Detects	11	Number of Non-Detects	37
Number of Distinct Detects	11	Number of Distinct Non-Detects	18
Minimum Detect	36	Minimum Non-Detect	35
Maximum Detect	5600	Maximum Non-Detect	36000
Variance Detects	3798309	Percent Non-Detects	77.08%
Mean Detects	1772	SD Detects	1949
Median Detects	1200	CV Detects	1.1
Skewness Detects	0.863	Kurtosis Detects	-0.438
Mean of Logged Detects	6.39	SD of Logged Detects	1.887

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.855
5% Shapiro Wilk Critical Value	0.85
Lilliefors Test Statistic	0.239
5% Lilliefors Critical Value	0.267

Shapiro Wilk GOF Test

Detected Data appear Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	467.1	Standard Error of Mean	178.7
SD	1159	95% KM (BCA) UCL	762.3
95% KM (t) UCL	766.9	95% KM (Percentile Bootstrap) UCL	745.9

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

95% KM (z) UCL	761	95% KM Bootstrap t UCL	914.8
90% KM Chebyshev UCL	1003	95% KM Chebyshev UCL	1246
97.5% KM Chebyshev UCL	1583	99% KM Chebyshev UCL	2245

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.471	Anderson-Darling GOF Test
5% A-D Critical Value	0.776	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.201	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.571	k star (bias corrected MLE)	0.476
Theta hat (MLE)	3104	Theta star (bias corrected MLE)	3724
nu hat (MLE)	12.56	nu star (bias corrected)	10.47
MLE Mean (bias corrected)	1772	MLE Sd (bias corrected)	2569

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.162	nu hat (KM)	15.58
Approximate Chi Square Value (15.58, α)	7.665	Adjusted Chi Square Value (15.58, β)	7.493
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	949.2	95% Gamma Adjusted KM-UCL (use when $n < 50$)	971

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	408.3
Maximum	5600	Median	0.01
SD	1172	CV	2.87
k hat (MLE)	0.102	k star (bias corrected MLE)	0.11
Theta hat (MLE)	3986	Theta star (bias corrected MLE)	3715
nu hat (MLE)	9.833	nu star (bias corrected)	10.55
MLE Mean (bias corrected)	408.3	MLE Sd (bias corrected)	1232
		Adjusted Level of Significance (β)	0.045
Approximate Chi Square Value (10.55, α)	4.29	Adjusted Chi Square Value (10.55, β)	4.166
95% Gamma Approximate UCL (use when $n \geq 50$)	1004	95% Gamma Adjusted UCL (use when $n < 50$)	1034

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.892	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.19	Lilliefors GOF Test
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	423	Mean in Log Scale	3.249
SD in Original Scale	1167	SD in Log Scale	2.261
95% t UCL (assumes normality of ROS data)	705.6	95% Percentile Bootstrap UCL	713.9
95% BCA Bootstrap UCL	820	95% Bootstrap t UCL	865.9
95% H-UCL (Log ROS)	1229		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

KM Mean (logged)	4.44	95% H-UCL (KM -Log)	486.8
KM SD (logged)	1.492	95% Critical H Value (KM-Log)	2.918
KM Standard Error of Mean (logged)	0.261		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1045	Mean in Log Scale	5.482
SD in Original Scale	2746	SD in Log Scale	1.712
95% t UCL (Assumes normality)	1710	95% H-Stat UCL	2315

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	766.9	95% KM (Percentile Bootstrap) UCL	745.9
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Dieldrin

General Statistics

Total Number of Observations	47	Number of Distinct Observations	44
		Number of Missing Observations	1
Number of Detects	42	Number of Non-Detects	5
Number of Distinct Detects	39	Number of Distinct Non-Detects	5
Minimum Detect	5.4	Minimum Non-Detect	3.5
Maximum Detect	20000	Maximum Non-Detect	4.1
Variance Detects	9728269	Percent Non-Detects	10.64%
Mean Detects	1145	SD Detects	3119
Median Detects	300	CV Detects	2.723
Skewness Detects	5.666	Kurtosis Detects	34.51
Mean of Logged Detects	5.606	SD of Logged Detects	1.812

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.352	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.357	Lilliefors GOF Test
5% Lilliefors Critical Value	0.137	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1024	Standard Error of Mean	433.2
SD	2934	95% KM (BCA) UCL	1888
95% KM (t) UCL	1751	95% KM (Percentile Bootstrap) UCL	1793
95% KM (z) UCL	1736	95% KM Bootstrap t UCL	3395
90% KM Chebyshev UCL	2323	95% KM Chebyshev UCL	2912
97.5% KM Chebyshev UCL	3729	99% KM Chebyshev UCL	5334

Gamma GOF Tests on Detected Observations Only

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

A-D Test Statistic	1.264	Anderson-Darling GOF Test
5% A-D Critical Value	0.825	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.176	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.145	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.449	k star (bias corrected MLE)	0.433
Theta hat (MLE)	2549	Theta star (bias corrected MLE)	2644
nu hat (MLE)	37.75	nu star (bias corrected)	36.39
MLE Mean (bias corrected)	1145	MLE Sd (bias corrected)	1740

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.122	nu hat (KM)	11.44
Approximate Chi Square Value (11.44, α)	4.864	Adjusted Chi Square Value (11.44, β)	4.728
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	2409	95% Gamma Adjusted KM-UCL (use when $n < 50$)	2479

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1024
Maximum	20000	Median	210
SD	2966	CV	2.898
k hat (MLE)	0.288	k star (bias corrected MLE)	0.284
Theta hat (MLE)	3555	Theta star (bias corrected MLE)	3607
nu hat (MLE)	27.06	nu star (bias corrected)	26.67
MLE Mean (bias corrected)	1024	MLE Sd (bias corrected)	1922
		Adjusted Level of Significance (β)	0.0449
Approximate Chi Square Value (26.67, α)	15.9	Adjusted Chi Square Value (26.67, β)	15.63
95% Gamma Approximate UCL (use when $n \geq 50$)	1717	95% Gamma Adjusted UCL (use when $n < 50$)	1746

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.938	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0752	Lilliefors GOF Test
5% Lilliefors Critical Value	0.137	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1024	Mean in Log Scale	5.18
SD in Original Scale	2966	SD in Log Scale	2.119
95% t UCL (assumes normality of ROS data)	1750	95% Percentile Bootstrap UCL	1853
95% BCA Bootstrap UCL	2409	95% Bootstrap t UCL	3279
95% H-UCL (Log ROS)	5424		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	5.143	95% H-UCL (KM -Log)	5955
KM SD (logged)	2.16	95% Critical H Value (KM-Log)	3.816
KM Standard Error of Mean (logged)	0.319		

DL/2 Statistics

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1024	Mean in Log Scale	5.079
SD in Original Scale	2966	SD in Log Scale	2.305
95% t UCL (Assumes normality)	1750	95% H-Stat UCL	8976

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 3729

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Gamma-Chlordane

General Statistics

Total Number of Observations	47	Number of Distinct Observations	38
		Number of Missing Observations	1
Number of Detects	43	Number of Non-Detects	4
Number of Distinct Detects	35	Number of Distinct Non-Detects	3
Minimum Detect	0.82	Minimum Non-Detect	1.8
Maximum Detect	9300	Maximum Non-Detect	2
Variance Detects	2065757	Percent Non-Detects	8.511%
Mean Detects	514.1	SD Detects	1437
Median Detects	130	CV Detects	2.796
Skewness Detects	5.714	Kurtosis Detects	35.16
Mean of Logged Detects	4.643	SD of Logged Detects	1.981

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.355
5% Shapiro Wilk Critical Value	0.943
Lilliefors Test Statistic	0.361
5% Lilliefors Critical Value	0.135

Shapiro Wilk GOF Test

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	470.4	Standard Error of Mean	201.6
SD	1366	95% KM (BCA) UCL	878.4
95% KM (t) UCL	808.9	95% KM (Percentile Bootstrap) UCL	845.7
95% KM (z) UCL	802.1	95% KM Bootstrap t UCL	1482
90% KM Chebyshev UCL	1075	95% KM Chebyshev UCL	1349
97.5% KM Chebyshev UCL	1730	99% KM Chebyshev UCL	2477

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.231
5% A-D Critical Value	0.834
K-S Test Statistic	0.172
5% K-S Critical Value	0.144

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Gamma Statistics on Detected Data Only

k hat (MLE)	0.41	k star (bias corrected MLE)	0.397
Theta hat (MLE)	1254	Theta star (bias corrected MLE)	1296
nu hat (MLE)	35.25	nu star (bias corrected)	34.12
MLE Mean (bias corrected)	514.1	MLE Sd (bias corrected)	816.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.119	nu hat (KM)	11.14
Approximate Chi Square Value (11.14, α)	4.669	Adjusted Chi Square Value (11.14, β)	4.536
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1123	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1156

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	470.3
Maximum	9300	Median	85
SD	1381	CV	2.936
k hat (MLE)	0.3	k star (bias corrected MLE)	0.295
Theta hat (MLE)	1567	Theta star (bias corrected MLE)	1594
nu hat (MLE)	28.21	nu star (bias corrected)	27.74
MLE Mean (bias corrected)	470.3	MLE Sd (bias corrected)	865.7
		Adjusted Level of Significance (β)	0.0449
Approximate Chi Square Value (27.74, α)	16.73	Adjusted Chi Square Value (27.74, β)	16.46
95% Gamma Approximate UCL (use when $n \geq 50$)	780	95% Gamma Adjusted UCL (use when $n < 50$)	792.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.977	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.943	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0658	Lilliefors GOF Test
5% Lilliefors Critical Value	0.135	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	470.5	Mean in Log Scale	4.291
SD in Original Scale	1381	SD in Log Scale	2.225
95% t UCL (assumes normality of ROS data)	808.6	95% Percentile Bootstrap UCL	822.5
95% BCA Bootstrap UCL	1119	95% Bootstrap t UCL	1555
95% H-UCL (Log ROS)	3126		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.231	95% H-UCL (KM -Log)	3902
KM SD (logged)	2.309	95% Critical H Value (KM-Log)	4.028
KM Standard Error of Mean (logged)	0.341		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	470.4	Mean in Log Scale	4.242
SD in Original Scale	1381	SD in Log Scale	2.313
95% t UCL (Assumes normality)	808.6	95% H-Stat UCL	3990

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use
97.5% KM (Chebyshev) UCL 1730

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor

General Statistics			
Total Number of Observations	33	Number of Distinct Observations	25
		Number of Missing Observations	15
Number of Detects	21	Number of Non-Detects	12
Number of Distinct Detects	20	Number of Distinct Non-Detects	5
Minimum Detect	16	Minimum Non-Detect	1.8
Maximum Detect	19000	Maximum Non-Detect	2.2
Variance Detects	17448550	Percent Non-Detects	36.36%
Mean Detects	1737	SD Detects	4177
Median Detects	150	CV Detects	2.405
Skewness Detects	3.872	Kurtosis Detects	16.23
Mean of Logged Detects	5.474	SD of Logged Detects	2.095

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.45	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.34	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.193	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	1106	Standard Error of Mean	598.9
SD	3357	95% KM (BCA) UCL	2224
95% KM (t) UCL	2120	95% KM (Percentile Bootstrap) UCL	2311
95% KM (z) UCL	2091	95% KM Bootstrap t UCL	4100
90% KM Chebyshev UCL	2903	95% KM Chebyshev UCL	3716
97.5% KM Chebyshev UCL	4846	99% KM Chebyshev UCL	7065

Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.423	Anderson-Darling GOF Test	
5% A-D Critical Value	0.838	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.25	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.204	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)	0.34	k star (bias corrected MLE)	0.323
Theta hat (MLE)	5105	Theta star (bias corrected MLE)	5371
nu hat (MLE)	14.29	nu star (bias corrected)	13.58

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

MLE Mean (bias corrected) 1737

MLE Sd (bias corrected) 3054

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.109	nu hat (KM)	7.162
Approximate Chi Square Value (7.16, α)	2.26	Adjusted Chi Square Value (7.16, β)	2.121
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3505	95% Gamma Adjusted KM-UCL (use when $n < 50$)	3735

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1105
Maximum	19000	Median	43
SD	3410	CV	3.085
k hat (MLE)	0.148	k star (bias corrected MLE)	0.155
Theta hat (MLE)	7463	Theta star (bias corrected MLE)	7138
nu hat (MLE)	9.775	nu star (bias corrected)	10.22
MLE Mean (bias corrected)	1105	MLE Sd (bias corrected)	2809
		Adjusted Level of Significance (β)	0.0419
Approximate Chi Square Value (10.22, α)	4.08	Adjusted Chi Square Value (10.22, β)	3.881
95% Gamma Approximate UCL (use when $n \geq 50$)	2769	95% Gamma Adjusted UCL (use when $n < 50$)	2911

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.921	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.908	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	Lilliefors GOF Test
5% Lilliefors Critical Value	0.193	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1106	Mean in Log Scale	3.6
SD in Original Scale	3409	SD in Log Scale	3.073
95% t UCL (assumes normality of ROS data)	2111	95% Percentile Bootstrap UCL	2159
95% BCA Bootstrap UCL	2958	95% Bootstrap t UCL	4130
95% H-UCL (Log ROS)	84885		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.697	95% H-UCL (KM -Log)	33889
KM SD (logged)	2.861	95% Critical H Value (KM-Log)	5.222
KM Standard Error of Mean (logged)	0.51		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	1106
SD in Original Scale	3409
95% t UCL (Assumes normality)	2111

DL/2 Log-Transformed

Mean in Log Scale	3.474
SD in Log Scale	3.157
95% H-Stat UCL	113804

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

99% KM (Chebyshev) UCL 7065

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor Epoxide

General Statistics

Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	27
Number of Detects	11	Number of Non-Detects	3
Number of Distinct Detects	10	Number of Distinct Non-Detects	2
Minimum Detect	0.73	Minimum Non-Detect	1.8
Maximum Detect	2900	Maximum Non-Detect	1.9
Variance Detects	744105	Percent Non-Detects	21.43%
Mean Detects	304.6	SD Detects	862.6
Median Detects	34	CV Detects	2.832
Skewness Detects	3.291	Kurtosis Detects	10.88
Mean of Logged Detects	3.204	SD of Logged Detects	2.325

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.395	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.462	Lilliefors GOF Test
5% Lilliefors Critical Value	0.267	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	239.5	Standard Error of Mean	207.3
SD	739.6	95% KM (BCA) UCL	649.5
95% KM (t) UCL	606.7	95% KM (Percentile Bootstrap) UCL	648
95% KM (z) UCL	580.5	95% KM Bootstrap t UCL	6211
90% KM Chebyshev UCL	861.5	95% KM Chebyshev UCL	1143
97.5% KM Chebyshev UCL	1534	99% KM Chebyshev UCL	2302

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.097	Anderson-Darling GOF Test
5% A-D Critical Value	0.829	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.292	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.277	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)	0.263
Theta hat (MLE)	1097	Theta star (bias corrected MLE)	1160
nu hat (MLE)	6.108	nu star (bias corrected)	5.775
MLE Mean (bias corrected)	304.6	MLE Sd (bias corrected)	594.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.105	nu hat (KM)	2.936
Approximate Chi Square Value (2.94, α)	0.354	Adjusted Chi Square Value (2.94, β)	0.265

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

95% Gamma Approximate KM-UCL (use when n>=50) 1988

95% Gamma Adjusted KM-UCL (use when n<50) 2653

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	239.3
Maximum	2900	Median	5.7
SD	767.6	CV	3.207
k hat (MLE)	0.188	k star (bias corrected MLE)	0.195
Theta hat (MLE)	1272	Theta star (bias corrected MLE)	1224
nu hat (MLE)	5.269	nu star (bias corrected)	5.474
MLE Mean (bias corrected)	239.3	MLE Sd (bias corrected)	541.3
		Adjusted Level of Significance (β)	0.0312
Approximate Chi Square Value (5.47, α)	1.377	Adjusted Chi Square Value (5.47, β)	1.125
95% Gamma Approximate UCL (use when n>=50)	951.4	95% Gamma Adjusted UCL (use when n<50)	1164

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.952	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.169	Lilliefors GOF Test
5% Lilliefors Critical Value	0.267	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	239.4	Mean in Log Scale	2.294
SD in Original Scale	767.6	SD in Log Scale	2.738
95% t UCL (assumes normality of ROS data)	602.7	95% Percentile Bootstrap UCL	647.7
95% BCA Bootstrap UCL	856.9	95% Bootstrap t UCL	5988
95% H-UCL (Log ROS)	46261		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.45	95% H-UCL (KM -Log)	9782
KM SD (logged)	2.438	95% Critical H Value (KM-Log)	5.57
KM Standard Error of Mean (logged)	0.683		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	239.5	Mean in Log Scale	2.502
SD in Original Scale	767.5	SD in Log Scale	2.47
95% t UCL (Assumes normality)	602.8	95% H-Stat UCL	12238

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 2302

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	48	Number of Distinct Observations	29
Number of Detects	46	Number of Non-Detects	2
Number of Distinct Detects	29	Number of Distinct Non-Detects	1
Minimum Detect	0.73	Minimum Non-Detect	2.6
Maximum Detect	11.4	Maximum Non-Detect	2.6
Variance Detects	5.12	Percent Non-Detects	4.167%
Mean Detects	3.073	SD Detects	2.263
Median Detects	2.55	CV Detects	0.736
Skewness Detects	2.501	Kurtosis Detects	6.886
Mean of Logged Detects	0.939	SD of Logged Detects	0.584

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.718	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.221	Lilliefors GOF Test
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	3.017	Standard Error of Mean	0.323
SD	2.209	95% KM (BCA) UCL	3.582
95% KM (t) UCL	3.558	95% KM (Percentile Bootstrap) UCL	3.586
95% KM (z) UCL	3.548	95% KM Bootstrap t UCL	3.786
90% KM Chebyshev UCL	3.985	95% KM Chebyshev UCL	4.424
97.5% KM Chebyshev UCL	5.032	99% KM Chebyshev UCL	6.228

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.132	Anderson-Darling GOF Test
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.136	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.131	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)	2.885	k star (bias corrected MLE)	2.712
Theta hat (MLE)	1.065	Theta star (bias corrected MLE)	1.133
nu hat (MLE)	265.4	nu star (bias corrected)	249.5
MLE Mean (bias corrected)	3.073	MLE Sd (bias corrected)	1.866

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.864	nu hat (KM)	179
Approximate Chi Square Value (178.98, α)	149	Adjusted Chi Square Value (178.98, β)	148.2
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3.623	95% Gamma Adjusted KM-UCL (use when $n < 50$)	3.644

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.73	Mean	3.006
Maximum	11.4	Median	2.4
SD	2.239	CV	0.745
k hat (MLE)	2.844	k star (bias corrected MLE)	2.68
Theta hat (MLE)	1.057	Theta star (bias corrected MLE)	1.122
nu hat (MLE)	273	nu star (bias corrected)	257.3
MLE Mean (bias corrected)	3.006	MLE Sd (bias corrected)	1.836
		Adjusted Level of Significance (β)	0.045
Approximate Chi Square Value (257.30, α)	221.2	Adjusted Chi Square Value (257.30, β)	220.1
95% Gamma Approximate UCL (use when $n \geq 50$)	3.498	95% Gamma Adjusted UCL (use when $n < 50$)	3.514

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.962	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0925	Lilliefors GOF Test
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.016	Mean in Log Scale	0.922
SD in Original Scale	2.232	SD in Log Scale	0.579
95% t UCL (assumes normality of ROS data)	3.557	95% Percentile Bootstrap UCL	3.577
95% BCA Bootstrap UCL	3.677	95% Bootstrap t UCL	3.736
95% H-UCL (Log ROS)	3.504		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.921	95% H-UCL (KM -Log)	3.492
KM SD (logged)	0.576	95% Critical H Value (KM-Log)	1.943
KM Standard Error of Mean (logged)	0.0847		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.999	Mean in Log Scale	0.911
SD in Original Scale	2.243	SD in Log Scale	0.588
95% t UCL (Assumes normality)	3.542	95% H-Stat UCL	3.495

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	4.424
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium

General Statistics

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Total Number of Observations	48	Number of Distinct Observations	45
		Number of Missing Observations	0
Minimum	8.6	Mean	42.86
Maximum	690	Median	21.3
SD	99.85	Std. Error of Mean	14.41
Coefficient of Variation	2.33	Skewness	6.087

Normal GOF Test

Shapiro Wilk Test Statistic	0.303
5% Shapiro Wilk Critical Value	0.947
Lilliefors Test Statistic	0.395
5% Lilliefors Critical Value	0.128

Shapiro Wilk GOF Test

Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL

95% Student's-t UCL	67.04
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	80.09
95% Modified-t UCL (Johnson-1978)	69.15

Gamma GOF Test

A-D Test Statistic	7.244
5% A-D Critical Value	0.778
K-S Test Statistic	0.336
5% K-S Critical Value	0.132

Anderson-Darling Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.028
Theta hat (MLE)	41.71
nu hat (MLE)	98.65
MLE Mean (bias corrected)	42.86
Adjusted Level of Significance	0.045

k star (bias corrected MLE)	0.977
Theta star (bias corrected MLE)	43.85
nu star (bias corrected)	93.81
MLE Sd (bias corrected)	43.35
Approximate Chi Square Value (0.05)	72.48
Adjusted Chi Square Value	71.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	55.47
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95% Adjusted Gamma UCL (use when n<50)	55.92
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Lognormal GOF Test

Shapiro Wilk Test Statistic	0.764
5% Shapiro Wilk Critical Value	0.947
Lilliefors Test Statistic	0.264
5% Lilliefors Critical Value	0.128

Shapiro Wilk Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Lilliefors Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.152
Maximum of Logged Data	6.537

Mean of logged Data	3.198
SD of logged Data	0.77

Assuming Lognormal Distribution

95% H-UCL	41.69
95% Chebyshev (MVUE) UCL	50.25
99% Chebyshev (MVUE) UCL	72.81

90% Chebyshev (MVUE) UCL	44.77
97.5% Chebyshev (MVUE) UCL	57.86

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs			
95% CLT UCL	66.56	95% Jackknife UCL	67.04
95% Standard Bootstrap UCL	66.08	95% Bootstrap-t UCL	134.8
95% Hall's Bootstrap UCL	139.5	95% Percentile Bootstrap UCL	70.52
95% BCA Bootstrap UCL	86.14		
90% Chebyshev(Mean, Sd) UCL	86.09	95% Chebyshev(Mean, Sd) UCL	105.7
97.5% Chebyshev(Mean, Sd) UCL	132.9	99% Chebyshev(Mean, Sd) UCL	186.3

Suggested UCL to Use
95% Chebyshev (Mean, Sd) UCL 105.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Manganese

General Statistics			
Total Number of Observations	48	Number of Distinct Observations	43
Number of Detects	47	Number of Non-Detects	1
Number of Distinct Detects	42	Number of Distinct Non-Detects	1
Minimum Detect	94.5	Minimum Non-Detect	57.3
Maximum Detect	24800	Maximum Non-Detect	57.3
Variance Detects	12766823	Percent Non-Detects	2.083%
Mean Detects	948.7	SD Detects	3573
Median Detects	369	CV Detects	3.766
Skewness Detects	6.75	Kurtosis Detects	45.98
Mean of Logged Detects	5.962	SD of Logged Detects	0.851

Normal GOF Test on Detects Only		Shapiro Wilk GOF Test
Shapiro Wilk Test Statistic	0.201	Detected Data Not Normal at 5% Significance Level
5% Shapiro Wilk Critical Value	0.946	
Lilliefors Test Statistic	0.462	Lilliefors GOF Test
5% Lilliefors Critical Value	0.129	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	930.1	Standard Error of Mean	510.7
SD	3500	95% KM (BCA) UCL	1963
95% KM (t) UCL	1787	95% KM (Percentile Bootstrap) UCL	1935
95% KM (z) UCL	1770	95% KM Bootstrap t UCL	11079
90% KM Chebyshev UCL	2462	95% KM Chebyshev UCL	3156
97.5% KM Chebyshev UCL	4119	99% KM Chebyshev UCL	6011

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	8.528	Anderson-Darling GOF Test
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.374	Kolmogrov-Smirnov GOF
5% K-S Critical Value	0.135	Detected Data Not Gamma Distributed at 5% Significance Level

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.679	k star (bias corrected MLE)	0.65
Theta hat (MLE)	1396	Theta star (bias corrected MLE)	1459
nu hat (MLE)	63.87	nu star (bias corrected)	61.12
MLE Mean (bias corrected)	948.7	MLE Sd (bias corrected)	1176

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0706	nu hat (KM)	6.779
Approximate Chi Square Value (6.78, α)	2.05	Adjusted Chi Square Value (6.78, β)	1.971
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3076	95% Gamma Adjusted KM-UCL (use when $n < 50$)	3200

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	928.9
Maximum	24800	Median	368
SD	3538	CV	3.808
k hat (MLE)	0.57	k star (bias corrected MLE)	0.548
Theta hat (MLE)	1630	Theta star (bias corrected MLE)	1694
nu hat (MLE)	54.72	nu star (bias corrected)	52.63
MLE Mean (bias corrected)	928.9	MLE Sd (bias corrected)	1255
		Adjusted Level of Significance (β)	0.045
Approximate Chi Square Value (52.63, α)	36.97	Adjusted Chi Square Value (52.63, β)	36.56
95% Gamma Approximate UCL (use when $n \geq 50$)	1323	95% Gamma Adjusted UCL (use when $n < 50$)	1337

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.778	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	Lilliefors GOF Test
5% Lilliefors Critical Value	0.129	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	930.1	Mean in Log Scale	5.922
SD in Original Scale	3537	SD in Log Scale	0.886
95% t UCL (assumes normality of ROS data)	1787	95% Percentile Bootstrap UCL	1948
95% BCA Bootstrap UCL	2877	95% Bootstrap t UCL	10668
95% H-UCL (Log ROS)	735.9		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	929.5	Mean in Log Scale	5.908
SD in Original Scale	3537	SD in Log Scale	0.922
95% t UCL (Assumes normality)	1786	95% H-Stat UCL	762.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Appendix C-1
ProUCL Output - Surface Soil (Current Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Suggested UCL to Use

95% KM (Chebyshev) UCL 3156

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options
Date/Time of Computation 2/8/2016 7:49:15 PM
From File ProUCL_Input_a.xls
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

Trichloroethene

General Statistics

Total Number of Observations	74	Number of Distinct Observations	44
		Number of Missing Observations	1
Number of Detects	19	Number of Non-Detects	55
Number of Distinct Detects	17	Number of Distinct Non-Detects	31
Minimum Detect	0.71	Minimum Non-Detect	3.2
Maximum Detect	14	Maximum Non-Detect	280
Variance Detects	8.796	Percent Non-Detects	74.32%
Mean Detects	2.999	SD Detects	2.966
Median Detects	2.1	CV Detects	0.989
Skewness Detects	3.102	Kurtosis Detects	11.26
Mean of Logged Detects	0.821	SD of Logged Detects	0.71

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.642	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.236	Lilliefors GOF Test
5% Lilliefors Critical Value	0.203	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.317	Standard Error of Mean	0.291
SD	1.763	95% KM (BCA) UCL	2.845
95% KM (t) UCL	2.802	95% KM (Percentile Bootstrap) UCL	2.816
95% KM (z) UCL	2.795	95% KM Bootstrap t UCL	2.902
90% KM Chebyshev UCL	3.189	95% KM Chebyshev UCL	3.584
97.5% KM Chebyshev UCL	4.132	99% KM Chebyshev UCL	5.209

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.625	Anderson-Darling GOF Test
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.145	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.201	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.954	k star (bias corrected MLE)	1.68
Theta hat (MLE)	1.535	Theta star (bias corrected MLE)	1.785
nu hat (MLE)	74.24	nu star (bias corrected)	63.85
MLE Mean (bias corrected)	2.999	MLE Sd (bias corrected)	2.313

Gamma Kaplan-Meier (KM) Statistics

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

k hat (KM)	1.727	nu hat (KM)	255.6
Approximate Chi Square Value (255.62, α)	219.6	Adjusted Chi Square Value (255.62, β)	218.9
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	2.698	95% Gamma Adjusted KM-UCL (use when $n < 50$)	2.706

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.514	Mean	2.166
Maximum	14	Median	1.862
SD	1.691	CV	0.78
k hat (MLE)	3.251	k star (bias corrected MLE)	3.129
Theta hat (MLE)	0.666	Theta star (bias corrected MLE)	0.692
nu hat (MLE)	481.2	nu star (bias corrected)	463
MLE Mean (bias corrected)	2.166	MLE Sd (bias corrected)	1.225
		Adjusted Level of Significance (β)	0.0468
Approximate Chi Square Value (463.04, α)	414.1	Adjusted Chi Square Value (463.04, β)	413.2
95% Gamma Approximate UCL (use when $n \geq 50$)	2.422	95% Gamma Adjusted UCL (use when $n < 50$)	2.427

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.961	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.121	Lilliefors GOF Test
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.201	Mean in Log Scale	0.671
SD in Original Scale	1.61	SD in Log Scale	0.431
95% t UCL (assumes normality of ROS data)	2.513	95% Percentile Bootstrap UCL	2.56
95% BCA Bootstrap UCL	2.654	95% Bootstrap t UCL	2.787
95% H-UCL (Log ROS)	2.353		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.665	95% H-UCL (KM -Log)	2.58
KM SD (logged)	0.563	95% Critical H Value (KM-Log)	1.894
KM Standard Error of Mean (logged)	0.122		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	4.717	Mean in Log Scale	1.001
SD in Original Scale	16.03	SD in Log Scale	0.636
95% t UCL (Assumes normality)	7.822	95% H-Stat UCL	3.848

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.802	95% GROS Approximate Gamma UCL	2.422
95% Approximate Gamma KM-UCL	2.698		

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics

Total Number of Observations	69	Number of Distinct Observations	41
		Number of Missing Observations	6
Number of Detects	41	Number of Non-Detects	28
Number of Distinct Detects	37	Number of Distinct Non-Detects	4
Minimum Detect	9.3	Minimum Non-Detect	170
Maximum Detect	2400	Maximum Non-Detect	200
Variance Detects	213433	Percent Non-Detects	40.58%
Mean Detects	217.6	SD Detects	462
Median Detects	40	CV Detects	2.123
Skewness Detects	3.441	Kurtosis Detects	13.19
Mean of Logged Detects	4.116	SD of Logged Detects	1.456

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.505	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.941	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.373	Lilliefors GOF Test
5% Lilliefors Critical Value	0.138	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	145.7	Standard Error of Mean	44.32
SD	362.8	95% KM (BCA) UCL	226.1
95% KM (t) UCL	219.6	95% KM (Percentile Bootstrap) UCL	224
95% KM (z) UCL	218.6	95% KM Bootstrap t UCL	290.7
90% KM Chebyshev UCL	278.6	95% KM Chebyshev UCL	338.9
97.5% KM Chebyshev UCL	422.5	99% KM Chebyshev UCL	586.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.629	Anderson-Darling GOF Test
5% A-D Critical Value	0.813	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.258	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.146	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)	0.501	k star (bias corrected MLE)	0.481
Theta hat (MLE)	434.1	Theta star (bias corrected MLE)	452.5
nu hat (MLE)	41.1	nu star (bias corrected)	39.43
MLE Mean (bias corrected)	217.6	MLE Sd (bias corrected)	313.8

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.161	nu hat (KM)	22.25
Approximate Chi Square Value (22.25, α)	12.52	Adjusted Chi Square Value (22.25, β)	12.37
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	258.8	95% Gamma Adjusted KM-UCL (use when $n < 50$)	262

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	153.6
Maximum	2400	Median	36
SD	368.1	CV	2.396
k hat (MLE)	0.247	k star (bias corrected MLE)	0.246
Theta hat (MLE)	621.2	Theta star (bias corrected MLE)	624
nu hat (MLE)	34.13	nu star (bias corrected)	33.98
MLE Mean (bias corrected)	153.6	MLE Sd (bias corrected)	309.6
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (33.98, α)	21.65	Adjusted Chi Square Value (33.98, β)	21.44
95% Gamma Approximate UCL (use when $n \geq 50$)	241.1	95% Gamma Adjusted UCL (use when $n < 50$)	243.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.899	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.941	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.169	Lilliefors GOF Test
5% Lilliefors Critical Value	0.138	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	150.3	Mean in Log Scale	3.908
SD in Original Scale	364.6	SD in Log Scale	1.276
95% t UCL (assumes normality of ROS data)	223.5	95% Percentile Bootstrap UCL	222.3
95% BCA Bootstrap UCL	256.1	95% Bootstrap t UCL	287.2
95% H-UCL (Log ROS)	155.6		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	166.8	Mean in Log Scale	4.282
SD in Original Scale	359.7	SD in Log Scale	1.135
95% t UCL (Assumes normality)	239	95% H-Stat UCL	187.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 338.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	73	Number of Distinct Observations	48
		Number of Missing Observations	2

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Number of Detects	52	Number of Non-Detects	21
Number of Distinct Detects	45	Number of Distinct Non-Detects	4
Minimum Detect	10	Minimum Non-Detect	170
Maximum Detect	3500	Maximum Non-Detect	200
Variance Detects	459986	Percent Non-Detects	28.77%
Mean Detects	295.5	SD Detects	678.2
Median Detects	65.5	CV Detects	2.295
Skewness Detects	3.717	Kurtosis Detects	14.5
Mean of Logged Detects	4.431	SD of Logged Detects	1.401

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.454
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.375
5% Lilliefors Critical Value	0.123

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	227.6	Standard Error of Mean	68.31
SD	577.3	95% KM (BCA) UCL	362
95% KM (t) UCL	341.4	95% KM (Percentile Bootstrap) UCL	341.2
95% KM (z) UCL	340	95% KM Bootstrap t UCL	450.2
90% KM Chebyshev UCL	432.6	95% KM Chebyshev UCL	525.4
97.5% KM Chebyshev UCL	654.2	99% KM Chebyshev UCL	907.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.979
5% A-D Critical Value	0.814
K-S Test Statistic	0.269
5% K-S Critical Value	0.13

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.504	k star (bias corrected MLE)	0.488
Theta hat (MLE)	586	Theta star (bias corrected MLE)	605.5
nu hat (MLE)	52.45	nu star (bias corrected)	50.76
MLE Mean (bias corrected)	295.5	MLE Sd (bias corrected)	423

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.155	nu hat (KM)	22.7
Approximate Chi Square Value (22.70, α)	12.86	Adjusted Chi Square Value (22.70, β)	12.71
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	401.7	95% Gamma Adjusted KM-UCL (use when $n < 50$)	406.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	233.9
Maximum	3500	Median	48
SD	583.9	CV	2.496
k hat (MLE)	0.272	k star (bias corrected MLE)	0.27
Theta hat (MLE)	858.8	Theta star (bias corrected MLE)	865.3

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

nu hat (MLE)	39.77	nu star (bias corrected)	39.47
MLE Mean (bias corrected)	233.9	MLE Sd (bias corrected)	449.9
		Adjusted Level of Significance (β)	0.0467
Approximate Chi Square Value (39.47, α)	26.08	Adjusted Chi Square Value (39.47, β)	25.86
95% Gamma Approximate UCL (use when $n \geq 50$)	354.1	95% Gamma Adjusted UCL (use when $n < 50$)	357.1

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.173	Lilliefors GOF Test
5% Lilliefors Critical Value	0.123	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	231.5	Mean in Log Scale	4.302
SD in Original Scale	580.5	SD in Log Scale	1.277
95% t UCL (assumes normality of ROS data)	344.7	95% Percentile Bootstrap UCL	355.1
95% BCA Bootstrap UCL	405.7	95% Bootstrap t UCL	471.3
95% H-UCL (Log ROS)	244.6		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	237.2
SD in Original Scale	578.3
95% t UCL (Assumes normality)	349.9

DL/2 Log-Transformed

Mean in Log Scale	4.459
SD in Log Scale	1.18
95% H-Stat UCL	243.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 525.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aldrin

General Statistics

Total Number of Observations	73	Number of Distinct Observations	44
		Number of Missing Observations	2
Number of Detects	48	Number of Non-Detects	25
Number of Distinct Detects	38	Number of Distinct Non-Detects	7
Minimum Detect	1.1	Minimum Non-Detect	1.7
Maximum Detect	21000	Maximum Non-Detect	4.1
Variance Detects	9170643	Percent Non-Detects	34.25%
Mean Detects	896.6	SD Detects	3028
Median Detects	185	CV Detects	3.377
Skewness Detects	6.485	Kurtosis Detects	43.76
Mean of Logged Detects	4.826	SD of Logged Detects	2.205

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.285	Shapiro Wilk GOF Test
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Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
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5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.384	Lilliefors GOF Test
5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	590	Standard Error of Mean	291.8
SD	2467	95% KM (BCA) UCL	1176
95% KM (t) UCL	1076	95% KM (Percentile Bootstrap) UCL	1159
95% KM (z) UCL	1070	95% KM Bootstrap t UCL	2398
90% KM Chebyshev UCL	1465	95% KM Chebyshev UCL	1862
97.5% KM Chebyshev UCL	2412	99% KM Chebyshev UCL	3493

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.563	Anderson-Darling GOF Test
5% A-D Critical Value	0.852	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.159	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.138	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)	0.342	k star (bias corrected MLE)	0.335
Theta hat (MLE)	2621	Theta star (bias corrected MLE)	2680
nu hat (MLE)	32.84	nu star (bias corrected)	32.12
MLE Mean (bias corrected)	896.6	MLE Sd (bias corrected)	1550

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0572	nu hat (KM)	8.351
Approximate Chi Square Value (8.35, α)	2.94	Adjusted Chi Square Value (8.35, β)	2.876
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1676	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1713

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	589.6
Maximum	21000	Median	22
SD	2484	CV	4.213
k hat (MLE)	0.159	k star (bias corrected MLE)	0.162
Theta hat (MLE)	3702	Theta star (bias corrected MLE)	3643
nu hat (MLE)	23.25	nu star (bias corrected)	23.63
MLE Mean (bias corrected)	589.6	MLE Sd (bias corrected)	1465
		Adjusted Level of Significance (β)	0.0467
Approximate Chi Square Value (23.63, α)	13.57	Adjusted Chi Square Value (23.63, β)	13.41
95% Gamma Approximate UCL (use when $n \geq 50$)	1027	95% Gamma Adjusted UCL (use when $n < 50$)	1039

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.968	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.111	Lilliefors GOF Test
5% Lilliefors Critical Value	0.128	Detected Data appear Lognormal at 5% Significance Level

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ProUCL Output - Surface Soil (Future Scenario)
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Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	590.1	Mean in Log Scale	3.174
SD in Original Scale	2484	SD in Log Scale	2.988
95% t UCL (assumes normality of ROS data)	1075	95% Percentile Bootstrap UCL	1168
95% BCA Bootstrap UCL	1492	95% Bootstrap t UCL	2413
95% H-UCL (Log ROS)	10983		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.215	95% H-UCL (KM -Log)	6615
KM SD (logged)	2.848	95% Critical H Value (KM-Log)	4.544
KM Standard Error of Mean (logged)	0.337		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	589.9
SD in Original Scale	2484
95% t UCL (Assumes normality)	1074

DL/2 Log-Transformed

Mean in Log Scale	3.173
SD in Log Scale	2.916
95% H-Stat UCL	8256

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 2412

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aroclor 1248

General Statistics

Total Number of Observations	75	Number of Distinct Observations	63
Number of Detects	68	Number of Non-Detects	7
Number of Distinct Detects	59	Number of Distinct Non-Detects	4
Minimum Detect	110	Minimum Non-Detect	36
Maximum Detect	2300000	Maximum Non-Detect	39
Variance Detects	7.904E+10	Percent Non-Detects	9.333%
Mean Detects	72059	SD Detects	281141
Median Detects	10500	CV Detects	3.902
Skewness Detects	7.659	Kurtosis Detects	61.25
Mean of Logged Detects	9.282	SD of Logged Detects	2.009

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.25
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.399
5% Lilliefors Critical Value	0.107

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
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Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	65337	Standard Error of Mean	31007
SD	266549	95% KM (BCA) UCL	128019
95% KM (t) UCL	116986	95% KM (Percentile Bootstrap) UCL	125082
95% KM (z) UCL	116339	95% KM Bootstrap t UCL	270406
90% KM Chebyshev UCL	158359	95% KM Chebyshev UCL	200494
97.5% KM Chebyshev UCL	258977	99% KM Chebyshev UCL	373855

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.956	Anderson-Darling GOF Test
5% A-D Critical Value	0.852	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.189	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.117	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.353	k star (bias corrected MLE)	0.347
Theta hat (MLE)	204194	Theta star (bias corrected MLE)	207585
nu hat (MLE)	47.99	nu star (bias corrected)	47.21
MLE Mean (bias corrected)	72059	MLE Sd (bias corrected)	122304

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0601	nu hat (KM)	9.013
Approximate Chi Square Value (9.01, α)	3.335	Adjusted Chi Square Value (9.01, β)	3.267
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	176590	95% Gamma Adjusted KM-UCL (use when $n < 50$)	180237

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	65333
Maximum	2300000	Median	7700
SD	268345	CV	4.107
k hat (MLE)	0.232	k star (bias corrected MLE)	0.231
Theta hat (MLE)	281811	Theta star (bias corrected MLE)	282279
nu hat (MLE)	34.78	nu star (bias corrected)	34.72
MLE Mean (bias corrected)	65333	MLE Sd (bias corrected)	135802
		Adjusted Level of Significance (β)	0.0468
Approximate Chi Square Value (34.72, α)	22.24	Adjusted Chi Square Value (34.72, β)	22.04
95% Gamma Approximate UCL (use when $n \geq 50$)	101994	95% Gamma Adjusted UCL (use when $n < 50$)	102901

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0586	Lilliefors GOF Test
5% Lilliefors Critical Value	0.107	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	65345	Mean in Log Scale	8.861
SD in Original Scale	268342	SD in Log Scale	2.327
95% t UCL (assumes normality of ROS data)	116958	95% Percentile Bootstrap UCL	123972
95% BCA Bootstrap UCL	167430	95% Bootstrap t UCL	269231

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
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95% H-UCL (Log ROS) 299281

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	8.75	95% H-UCL (KM -Log)	504991
KM SD (logged)	2.521	95% Critical H Value (KM-Log)	4.11
KM Standard Error of Mean (logged)	0.293		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	65335
SD in Original Scale	268344
95% t UCL (Assumes normality)	116948

DL/2 Log-Transformed

Mean in Log Scale	8.689
SD in Log Scale	2.669
95% H-Stat UCL	795714

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 258977

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aroclor 1254

General Statistics

Total Number of Observations	75	Number of Distinct Observations	34
Number of Detects	12	Number of Non-Detects	63
Number of Distinct Detects	12	Number of Distinct Non-Detects	25
Minimum Detect	36	Minimum Non-Detect	33
Maximum Detect	5600	Maximum Non-Detect	36000
Variance Detects	3669602	Percent Non-Detects	84%
Mean Detects	1638	SD Detects	1916
Median Detects	720	CV Detects	1.17
Skewness Detects	0.999	Kurtosis Detects	-0.167
Mean of Logged Detects	6.28	SD of Logged Detects	1.839

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.826
5% Shapiro Wilk Critical Value	0.859
Lilliefors Test Statistic	0.267
5% Lilliefors Critical Value	0.256

Shapiro Wilk GOF Test

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	305.3	Standard Error of Mean	115.5
SD	946.8	95% KM (BCA) UCL	515.5
95% KM (t) UCL	497.7	95% KM (Percentile Bootstrap) UCL	499.5
95% KM (z) UCL	495.3	95% KM Bootstrap t UCL	616
90% KM Chebyshev UCL	651.8	95% KM Chebyshev UCL	808.8
97.5% KM Chebyshev UCL	1027	99% KM Chebyshev UCL	1455

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.551	Anderson-Darling GOF Test
5% A-D Critical Value	0.781	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.23	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.258	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.557	k star (bias corrected MLE)	0.474
Theta hat (MLE)	2939	Theta star (bias corrected MLE)	3458
nu hat (MLE)	13.38	nu star (bias corrected)	11.37
MLE Mean (bias corrected)	1638	MLE Sd (bias corrected)	2380

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.104	nu hat (KM)	15.59
Approximate Chi Square Value (15.59, α)	7.677	Adjusted Chi Square Value (15.59, β)	7.568
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	620.1	95% Gamma Adjusted KM-UCL (use when $n < 50$)	629.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	262.1
Maximum	5600	Median	0.01
SD	954.4	CV	3.642
k hat (MLE)	0.0967	k star (bias corrected MLE)	0.102
Theta hat (MLE)	2710	Theta star (bias corrected MLE)	2576
nu hat (MLE)	14.51	nu star (bias corrected)	15.26
MLE Mean (bias corrected)	262.1	MLE Sd (bias corrected)	821.6
		Adjusted Level of Significance (β)	0.0468
Approximate Chi Square Value (15.26, α)	7.443	Adjusted Chi Square Value (15.26, β)	7.336
95% Gamma Approximate UCL (use when $n \geq 50$)	537.3	95% Gamma Adjusted UCL (use when $n < 50$)	545.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.9	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.172	Lilliefors GOF Test
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	268	Mean in Log Scale	1.64
SD in Original Scale	952.8	SD in Log Scale	2.661
95% t UCL (assumes normality of ROS data)	451.3	95% Percentile Bootstrap UCL	454.6
95% BCA Bootstrap UCL	529.3	95% Bootstrap t UCL	574.6
95% H-UCL (Log ROS)	672		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.058	95% H-UCL (KM -Log)	190.8
KM SD (logged)	1.277	95% Critical H Value (KM-Log)	2.546
KM Standard Error of Mean (logged)	0.168		

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	721.4	Mean in Log Scale	4.908
SD in Original Scale	2238	SD in Log Scale	1.753
95% t UCL (Assumes normality)	1152	95% H-Stat UCL	1187

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use			
95% KM (t) UCL	497.7	95% GROS Approximate Gamma UCL	537.3
95% Approximate Gamma KM-UCL	620.1		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Delta-BHC

General Statistics			
Total Number of Observations	59	Number of Distinct Observations	39
		Number of Missing Observations	16
Number of Detects	41	Number of Non-Detects	18
Number of Distinct Detects	35	Number of Distinct Non-Detects	6
Minimum Detect	0.46	Minimum Non-Detect	1.7
Maximum Detect	1400	Maximum Non-Detect	2.2
Variance Detects	110208	Percent Non-Detects	30.51%
Mean Detects	130.1	SD Detects	332
Median Detects	11	CV Detects	2.552
Skewness Detects	3.201	Kurtosis Detects	9.271
Mean of Logged Detects	2.823	SD of Logged Detects	1.966

Normal GOF Test on Detects Only		Shapiro Wilk GOF Test	
Shapiro Wilk Test Statistic	0.428	Detected Data Not Normal at 5% Significance Level	
5% Shapiro Wilk Critical Value	0.941		
Lilliefors Test Statistic	0.379	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.138	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	90.71	Standard Error of Mean	36.87
SD	279.7	95% KM (BCA) UCL	157.6
95% KM (t) UCL	152.3	95% KM (Percentile Bootstrap) UCL	152.7
95% KM (z) UCL	151.4	95% KM Bootstrap t UCL	193.3
90% KM Chebyshev UCL	201.3	95% KM Chebyshev UCL	251.4
97.5% KM Chebyshev UCL	321	99% KM Chebyshev UCL	457.6

Gamma GOF Tests on Detected Observations Only		Anderson-Darling GOF Test	
A-D Test Statistic	3.413	Detected Data Not Gamma Distributed at 5% Significance Level	
5% A-D Critical Value	0.851		

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ProUCL Output - Surface Soil (Future Scenario)
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K-S Test Statistic	0.24	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.149	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)	0.332	k star (bias corrected MLE)	0.324
Theta hat (MLE)	392.1	Theta star (bias corrected MLE)	401.8
nu hat (MLE)	27.2	nu star (bias corrected)	26.55
MLE Mean (bias corrected)	130.1	MLE Sd (bias corrected)	228.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.105	nu hat (KM)	12.41
Approximate Chi Square Value (12.41, α)	5.498	Adjusted Chi Square Value (12.41, β)	5.383
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	204.7	95% Gamma Adjusted KM-UCL (use when $n < 50$)	209.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	90.39
Maximum	1400	Median	4.8
SD	282.2	CV	3.122
k hat (MLE)	0.188	k star (bias corrected MLE)	0.19
Theta hat (MLE)	480.2	Theta star (bias corrected MLE)	475.9
nu hat (MLE)	22.21	nu star (bias corrected)	22.41
MLE Mean (bias corrected)	90.39	MLE Sd (bias corrected)	207.4
		Adjusted Level of Significance (β)	0.0459
Approximate Chi Square Value (22.41, α)	12.65	Adjusted Chi Square Value (22.41, β)	12.46
95% Gamma Approximate UCL (use when $n \geq 50$)	160.2	95% Gamma Adjusted UCL (use when $n < 50$)	162.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.946	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.941	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.123	Lilliefors GOF Test
5% Lilliefors Critical Value	0.138	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	90.56	Mean in Log Scale	1.682
SD in Original Scale	282.2	SD in Log Scale	2.437
95% t UCL (assumes normality of ROS data)	152	95% Percentile Bootstrap UCL	160.8
95% BCA Bootstrap UCL	176.6	95% Bootstrap t UCL	188.2
95% H-UCL (Log ROS)	469.9		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.939	95% H-UCL (KM -Log)	204
KM SD (logged)	2.121	95% Critical H Value (KM-Log)	4.056
KM Standard Error of Mean (logged)	0.296		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	90.68	Mean in Log Scale	1.953

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ProUCL Output - Surface Soil (Future Scenario)
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SD in Original Scale 282.1	SD in Log Scale 2.103
95% t UCL (Assumes normality) 152.1	95% H-Stat UCL 195.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use
97.5% KM (Chebyshev) UCL 321

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Dieldrin

General Statistics			
Total Number of Observations	73	Number of Distinct Observations	63
		Number of Missing Observations	2
Number of Detects	65	Number of Non-Detects	8
Number of Distinct Detects	57	Number of Distinct Non-Detects	6
Minimum Detect	0.36	Minimum Non-Detect	3.5
Maximum Detect	20000	Maximum Non-Detect	4.1
Variance Detects	6619560	Percent Non-Detects	10.96%
Mean Detects	884.6	SD Detects	2573
Median Detects	180	CV Detects	2.908
Skewness Detects	6.66	Kurtosis Detects	49.23
Mean of Logged Detects	5.068	SD of Logged Detects	2.069

Normal GOF Test on Detects Only		Normal GOF Test on Detected Observations Only	
Shapiro Wilk Test Statistic	0.347	Detected Data Not Normal at 5% Significance Level	
5% Shapiro Wilk P Value	0		
Lilliefors Test Statistic	0.366	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.11	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	787.7	Standard Error of Mean	286
SD	2425	95% KM (BCA) UCL	1378
95% KM (t) UCL	1264	95% KM (Percentile Bootstrap) UCL	1306
95% KM (z) UCL	1258	95% KM Bootstrap t UCL	2071
90% KM Chebyshev UCL	1646	95% KM Chebyshev UCL	2034
97.5% KM Chebyshev UCL	2574	99% KM Chebyshev UCL	3634

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.692	Anderson-Darling GOF Test	
5% A-D Critical Value	0.844	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.16	Kolmogrov-Smirnoff GOF	
5% K-S Critical Value	0.119	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

k hat (MLE)	0.386	k star (bias corrected MLE)	0.378
Theta hat (MLE)	2295	Theta star (bias corrected MLE)	2340
nu hat (MLE)	50.12	nu star (bias corrected)	49.14
MLE Mean (bias corrected)	884.6	MLE Sd (bias corrected)	1439

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.106	nu hat (KM)	15.41
Approximate Chi Square Value (15.41, α)	7.546	Adjusted Chi Square Value (15.41, β)	7.435
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1608	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1632

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	787.7
Maximum	20000	Median	120
SD	2442	CV	3.1
k hat (MLE)	0.264	k star (bias corrected MLE)	0.263
Theta hat (MLE)	2978	Theta star (bias corrected MLE)	2998
nu hat (MLE)	38.62	nu star (bias corrected)	38.36
MLE Mean (bias corrected)	787.7	MLE Sd (bias corrected)	1537
		Adjusted Level of Significance (β)	0.0467
Approximate Chi Square Value (38.36, α)	25.18	Adjusted Chi Square Value (38.36, β)	24.96
95% Gamma Approximate UCL (use when $n \geq 50$)	1200	95% Gamma Adjusted UCL (use when $n < 50$)	1211

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0665	Lilliefors GOF Test
5% Lilliefors Critical Value	0.11	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	787.9	Mean in Log Scale	4.591
SD in Original Scale	2442	SD in Log Scale	2.386
95% t UCL (assumes normality of ROS data)	1264	95% Percentile Bootstrap UCL	1336
95% BCA Bootstrap UCL	1799	95% Bootstrap t UCL	2088
95% H-UCL (Log ROS)	5103		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.401	95% H-UCL (KM -Log)	13131
KM SD (logged)	2.715	95% Critical H Value (KM-Log)	4.361
KM Standard Error of Mean (logged)	0.32		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	787.9
SD in Original Scale	2442
95% t UCL (Assumes normality)	1264

DL/2 Log-Transformed

Mean in Log Scale	4.581
SD in Log Scale	2.4
95% H-Stat UCL	5287

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 2574

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Gamma-Chlordane

General Statistics

Total Number of Observations	74	Number of Distinct Observations	55
		Number of Missing Observations	1
Number of Detects	66	Number of Non-Detects	8
Number of Distinct Detects	52	Number of Distinct Non-Detects	3
Minimum Detect	0.82	Minimum Non-Detect	1.8
Maximum Detect	9300	Maximum Non-Detect	2
Variance Detects	1406324	Percent Non-Detects	10.81%
Mean Detects	395.3	SD Detects	1186
Median Detects	78	CV Detects	3
Skewness Detects	6.763	Kurtosis Detects	50.57
Mean of Logged Detects	4.249	SD of Logged Detects	1.999

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.338
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.37
5% Lilliefors Critical Value	0.109

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	352.6	Standard Error of Mean	131
SD	1118	95% KM (BCA) UCL	619.6
95% KM (t) UCL	570.9	95% KM (Percentile Bootstrap) UCL	599
95% KM (z) UCL	568.1	95% KM Bootstrap t UCL	935.3
90% KM Chebyshev UCL	745.6	95% KM Chebyshev UCL	923.6
97.5% KM Chebyshev UCL	1171	99% KM Chebyshev UCL	1656

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.078
5% A-D Critical Value	0.845
K-S Test Statistic	0.162
5% K-S Critical Value	0.118

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.383	k star (bias corrected MLE)	0.376
Theta hat (MLE)	1032	Theta star (bias corrected MLE)	1052
nu hat (MLE)	50.55	nu star (bias corrected)	49.58
MLE Mean (bias corrected)	395.3	MLE Sd (bias corrected)	645

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0995	nu hat (KM)	14.72
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Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Approximate Chi Square Value (14.72, α)	7.068	Adjusted Chi Square Value (14.72, β)	6.962
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	734.5	95% Gamma Adjusted KM-UCL (use when $n < 50$)	745.6

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has $> 50\%$ NDs with many tied observations at multiple DLs

GROS may not be used when k star of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	352.6
Maximum	9300	Median	51
SD	1126	CV	3.193
k hat (MLE)	0.272	k star (bias corrected MLE)	0.27
Theta hat (MLE)	1295	Theta star (bias corrected MLE)	1305
ν hat (MLE)	40.29	ν star (bias corrected)	39.99
MLE Mean (bias corrected)	352.6	MLE Sd (bias corrected)	678.2
		Adjusted Level of Significance (β)	0.0468
Approximate Chi Square Value (39.99, α)	26.5	Adjusted Chi Square Value (39.99, β)	26.28
95% Gamma Approximate UCL (use when $n \geq 50$)	532	95% Gamma Adjusted UCL (use when $n < 50$)	536.4

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.065	Lilliefors GOF Test
5% Lilliefors Critical Value	0.109	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	352.7	Mean in Log Scale	3.785
SD in Original Scale	1126	SD in Log Scale	2.321
95% t UCL (assumes normality of ROS data)	570.7	95% Percentile Bootstrap UCL	585.8
95% BCA Bootstrap UCL	760	95% Bootstrap t UCL	964.8
95% H-UCL (Log ROS)	1847		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.768	95% H-UCL (KM -Log)	1852
KM SD (logged)	2.327	95% Critical H Value (KM-Log)	3.844
KM Standard Error of Mean (logged)	0.273		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	352.7
SD in Original Scale	1126
95% t UCL (Assumes normality)	570.7

DL/2 Log-Transformed

Mean in Log Scale	3.783
SD in Log Scale	2.318
95% H-Stat UCL	1823

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 1171

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

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ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
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However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor

General Statistics

Total Number of Observations	54	Number of Distinct Observations	39
		Number of Missing Observations	21
Number of Detects	33	Number of Non-Detects	21
Number of Distinct Detects	32	Number of Distinct Non-Detects	7
Minimum Detect	3.7	Minimum Non-Detect	1.7
Maximum Detect	19000	Maximum Non-Detect	3.8
Variance Detects	11528746	Percent Non-Detects	38.89%
Mean Detects	1217	SD Detects	3395
Median Detects	60	CV Detects	2.789
Skewness Detects	4.791	Kurtosis Detects	25.11
Mean of Logged Detects	4.818	SD of Logged Detects	2.235

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.393	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.36	Lilliefors GOF Test
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	744.6	Standard Error of Mean	370.4
SD	2680	95% KM (BCA) UCL	1481
95% KM (t) UCL	1365	95% KM (Percentile Bootstrap) UCL	1405
95% KM (z) UCL	1354	95% KM Bootstrap t UCL	2517
90% KM Chebyshev UCL	1856	95% KM Chebyshev UCL	2359
97.5% KM Chebyshev UCL	3058	99% KM Chebyshev UCL	4430

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.251	Anderson-Darling GOF Test
5% A-D Critical Value	0.855	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.239	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.166	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)	0.301	k star (bias corrected MLE)	0.294
Theta hat (MLE)	4040	Theta star (bias corrected MLE)	4139
nu hat (MLE)	19.89	nu star (bias corrected)	19.41
MLE Mean (bias corrected)	1217	MLE Sd (bias corrected)	2245

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0772	nu hat (KM)	8.337
Approximate Chi Square Value (8.34, α)	2.932	Adjusted Chi Square Value (8.34, β)	2.844
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	2118	95% Gamma Adjusted KM-UCL (use when $n < 50$)	2183

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
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GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	744
Maximum	19000	Median	16.5
SD	2705	CV	3.637
k hat (MLE)	0.142	k star (bias corrected MLE)	0.146
Theta hat (MLE)	5242	Theta star (bias corrected MLE)	5082
nu hat (MLE)	15.33	nu star (bias corrected)	15.81
MLE Mean (bias corrected)	744	MLE Sd (bias corrected)	1945
		Adjusted Level of Significance (β)	0.0456
Approximate Chi Square Value (15.81, α)	7.828	Adjusted Chi Square Value (15.81, β)	7.674
95% Gamma Approximate UCL (use when $n \geq 50$)	1503	95% Gamma Adjusted UCL (use when $n < 50$)	1533

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.941	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.931	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.156	Lilliefors GOF Test
5% Lilliefors Critical Value	0.154	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	744.3	Mean in Log Scale	2.675
SD in Original Scale	2705	SD in Log Scale	3.318
95% t UCL (assumes normality of ROS data)	1361	95% Percentile Bootstrap UCL	1454
95% BCA Bootstrap UCL	1788	95% Bootstrap t UCL	2657
95% H-UCL (Log ROS)	47046		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.151	95% H-UCL (KM -Log)	5366
KM SD (logged)	2.707	95% Critical H Value (KM-Log)	4.771
KM Standard Error of Mean (logged)	0.374		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	744.4	Mean in Log Scale	2.94
SD in Original Scale	2705	SD in Log Scale	2.944
95% t UCL (Assumes normality)	1361	95% H-Stat UCL	11425

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

99% KM (Chebyshev) UCL 4430

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor Epoxide

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

General Statistics

Total Number of Observations	24	Number of Distinct Observations	16
		Number of Missing Observations	44
Number of Detects	13	Number of Non-Detects	11
Number of Distinct Detects	12	Number of Distinct Non-Detects	4
Minimum Detect	0.73	Minimum Non-Detect	1.7
Maximum Detect	2900	Maximum Non-Detect	2
Variance Detects	629399	Percent Non-Detects	45.83%
Mean Detects	294.8	SD Detects	793.3
Median Detects	34	CV Detects	2.691
Skewness Detects	3.449	Kurtosis Detects	12.12
Mean of Logged Detects	3.375	SD of Logged Detects	2.289

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.417
5% Shapiro Wilk Critical Value	0.866
Lilliefors Test Statistic	0.399
5% Lilliefors Critical Value	0.246

Shapiro Wilk GOF Test

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	160	Standard Error of Mean	123.2
SD	579.8	95% KM (BCA) UCL	383.3
95% KM (t) UCL	371.2	95% KM (Percentile Bootstrap) UCL	383.9
95% KM (z) UCL	362.7	95% KM Bootstrap t UCL	2152
90% KM Chebyshev UCL	529.6	95% KM Chebyshev UCL	697
97.5% KM Chebyshev UCL	929.3	99% KM Chebyshev UCL	1386

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.958
5% A-D Critical Value	0.83
K-S Test Statistic	0.255
5% K-S Critical Value	0.256

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.299	k star (bias corrected MLE)	0.281
Theta hat (MLE)	987.4	Theta star (bias corrected MLE)	1049
nu hat (MLE)	7.764	nu star (bias corrected)	7.305
MLE Mean (bias corrected)	294.8	MLE Sd (bias corrected)	556.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0762	nu hat (KM)	3.657
Approximate Chi Square Value (3.66, α)	0.591	Adjusted Chi Square Value (3.66, β)	0.515
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	990.2	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1137

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	159.7
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Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Maximum	2900	Median	1.965
SD	592.4	CV	3.709
k hat (MLE)	0.144	k star (bias corrected MLE)	0.154
Theta hat (MLE)	1107	Theta star (bias corrected MLE)	1037
nu hat (MLE)	6.927	nu star (bias corrected)	7.394
MLE Mean (bias corrected)	159.7	MLE Sd (bias corrected)	406.9
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (7.39, α)	2.39	Adjusted Chi Square Value (7.39, β)	2.194
95% Gamma Approximate UCL (use when $n \geq 50$)	494.2	95% Gamma Adjusted UCL (use when $n < 50$)	538.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.973	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.127	Lilliefors GOF Test
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	159.9	Mean in Log Scale	1.155
SD in Original Scale	592.3	SD in Log Scale	3.108
95% t UCL (assumes normality of ROS data)	367.1	95% Percentile Bootstrap UCL	397.4
95% BCA Bootstrap UCL	537.5	95% Bootstrap t UCL	2283
95% H-UCL (Log ROS)	19562		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.684	95% H-UCL (KM -Log)	1294
KM SD (logged)	2.45	95% Critical H Value (KM-Log)	4.858
KM Standard Error of Mean (logged)	0.52		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	160.1	Mean in Log Scale	1.795
SD in Original Scale	592.2	SD in Log Scale	2.411
95% t UCL (Assumes normality)	367.3	95% H-Stat UCL	1225

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	383.3	95% GROS Adjusted Gamma UCL	538.2
95% Adjusted Gamma KM-UCL	1137		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	75	Number of Distinct Observations	33
Number of Detects	67	Number of Non-Detects	8

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Number of Distinct Detects	33	Number of Distinct Non-Detects	4
Minimum Detect	0.69	Minimum Non-Detect	2.5
Maximum Detect	11.4	Maximum Non-Detect	2.8
Variance Detects	3.854	Percent Non-Detects	10.67%
Mean Detects	2.759	SD Detects	1.963
Median Detects	2.3	CV Detects	0.712
Skewness Detects	2.97	Kurtosis Detects	10.45
Mean of Logged Detects	0.853	SD of Logged Detects	0.542

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.689
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.227
5% Lilliefors Critical Value	0.108

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.655	Standard Error of Mean	0.219
SD	1.873	95% KM (BCA) UCL	3.041
95% KM (t) UCL	3.02	95% KM (Percentile Bootstrap) UCL	3.03
95% KM (z) UCL	3.015	95% KM Bootstrap t UCL	3.141
90% KM Chebyshev UCL	3.312	95% KM Chebyshev UCL	3.61
97.5% KM Chebyshev UCL	4.022	99% KM Chebyshev UCL	4.833

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.604
5% A-D Critical Value	0.757
K-S Test Statistic	0.139
5% K-S Critical Value	0.11

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	3.255	k star (bias corrected MLE)	3.119
Theta hat (MLE)	0.848	Theta star (bias corrected MLE)	0.884
nu hat (MLE)	436.2	nu star (bias corrected)	418
MLE Mean (bias corrected)	2.759	MLE Sd (bias corrected)	1.562

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.009	nu hat (KM)	301.4
Approximate Chi Square Value (301.41, α)	262.2	Adjusted Chi Square Value (301.41, β)	261.5
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3.053	95% Gamma Adjusted KM-UCL (use when $n < 50$)	3.061

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.69	Mean	2.639
Maximum	11.4	Median	2.1
SD	1.893	CV	0.717
k hat (MLE)	3.276	k star (bias corrected MLE)	3.154
Theta hat (MLE)	0.806	Theta star (bias corrected MLE)	0.837
nu hat (MLE)	491.5	nu star (bias corrected)	473.1

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

MLE Mean (bias corrected)	2.639	MLE Sd (bias corrected)	1.486
		Adjusted Level of Significance (β)	0.0468
Approximate Chi Square Value (473.15, α)	423.7	Adjusted Chi Square Value (473.15, β)	422.8
95% Gamma Approximate UCL (use when $n \geq 50$)	2.947	95% Gamma Adjusted UCL (use when $n < 50$)	2.954

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.101	Lilliefors GOF Test
5% Lilliefors Critical Value	0.108	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.654	Mean in Log Scale	0.822
SD in Original Scale	1.882	SD in Log Scale	0.524
95% t UCL (assumes normality of ROS data)	3.016	95% Percentile Bootstrap UCL	3.045
95% BCA Bootstrap UCL	3.094	95% Bootstrap t UCL	3.176
95% H-UCL (Log ROS)	2.924		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.819	95% H-UCL (KM -Log)	2.93
KM SD (logged)	0.53	95% Critical H Value (KM-Log)	1.873
KM Standard Error of Mean (logged)	0.0632		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	2.607
SD in Original Scale	1.906
95% t UCL (Assumes normality)	2.974

DL/2 Log-Transformed

Mean in Log Scale	0.793
SD in Log Scale	0.542
95% H-Stat UCL	2.882

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 3.041

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium

General Statistics

Total Number of Observations	75	Number of Distinct Observations	67
		Number of Missing Observations	0
Minimum	8.6	Mean	35.4
Maximum	690	Median	21.2
SD	80.31	Std. Error of Mean	9.273
Coefficient of Variation	2.269	Skewness	7.595

Normal GOF Test

Shapiro Wilk Test Statistic 0.262

Shapiro Wilk GOF Test

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.407	Lilliefors GOF Test
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL

95% Student's-t UCL 50.84

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 59.34
95% Modified-t UCL (Johnson-1978) 52.2

Gamma GOF Test

A-D Test Statistic 10.47
5% A-D Critical Value 0.774
K-S Test Statistic 0.312
5% K-S Critical Value 0.105

Anderson-Darling Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE) 1.323
Theta hat (MLE) 26.76
nu hat (MLE) 198.4
MLE Mean (bias corrected) 35.4
Adjusted Level of Significance 0.0468

k star (bias corrected MLE) 1.279
Theta star (bias corrected MLE) 27.68
nu star (bias corrected) 191.8
MLE Sd (bias corrected) 31.3
Approximate Chi Square Value (0.05) 160.8
Adjusted Chi Square Value 160.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50) 42.23

95% Adjusted Gamma UCL (use when n<50) 42.38

Lognormal GOF Test

Shapiro Wilk Test Statistic 0.778
5% Shapiro Wilk P Value 8.882E-16
Lilliefors Test Statistic 0.198
5% Lilliefors Critical Value 0.102

Shapiro Wilk Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Lilliefors Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data 2.152
Maximum of Logged Data 6.537

Mean of logged Data 3.143
SD of logged Data 0.649

Assuming Lognormal Distribution

95% H-UCL 33.16
95% Chebyshev (MVUE) UCL 38.66
99% Chebyshev (MVUE) UCL 51.67

90% Chebyshev (MVUE) UCL 35.5
97.5% Chebyshev (MVUE) UCL 43.05

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL 50.65
95% Standard Bootstrap UCL 50.13
95% Hall's Bootstrap UCL 97.49
95% BCA Bootstrap UCL 64.75
90% Chebyshev(Mean, Sd) UCL 63.22

95% Jackknife UCL 50.84
95% Bootstrap-t UCL 91.93
95% Percentile Bootstrap UCL 53.29
95% Chebyshev(Mean, Sd) UCL 75.82

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

97.5% Chebyshev(Mean, Sd) UCL 93.31

99% Chebyshev(Mean, Sd) UCL 127.7

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 75.82

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	75	Number of Distinct Observations	67
Number of Detects	74	Number of Non-Detects	1
Number of Distinct Detects	66	Number of Distinct Non-Detects	1
Minimum Detect	94.5	Minimum Non-Detect	57.3
Maximum Detect	24800	Maximum Non-Detect	57.3
Variance Detects	8115620	Percent Non-Detects	1.333%
Mean Detects	756.4	SD Detects	2849
Median Detects	390	CV Detects	3.766
Skewness Detects	8.464	Kurtosis Detects	72.34
Mean of Logged Detects	5.973	SD of Logged Detects	0.707

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.169
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.465
5% Lilliefors Critical Value	0.103

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	747.1	Standard Error of Mean	326.9
SD	2812	95% KM (BCA) UCL	1414
95% KM (t) UCL	1292	95% KM (Percentile Bootstrap) UCL	1392
95% KM (z) UCL	1285	95% KM Bootstrap t UCL	6716
90% KM Chebyshev UCL	1728	95% KM Chebyshev UCL	2172
97.5% KM Chebyshev UCL	2789	99% KM Chebyshev UCL	4000

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	12.59
5% A-D Critical Value	0.786
K-S Test Statistic	0.361
5% K-S Critical Value	0.107

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnov GOF

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)	0.893	k star (bias corrected MLE)	0.866
Theta hat (MLE)	847	Theta star (bias corrected MLE)	873.6
nu hat (MLE)	132.2	nu star (bias corrected)	128.1
MLE Mean (bias corrected)	756.4	MLE Sd (bias corrected)	812.9

Gamma Kaplan-Meier (KM) Statistics

Appendix C-2
ProUCL Output - Surface Soil (Future Scenario)
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

k hat (KM)	0.0706	nu hat (KM)	10.59
Approximate Chi Square Value (10.59, α)	4.314	Adjusted Chi Square Value (10.59, β)	4.236
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1834	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1868

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	746.4
Maximum	24800	Median	390
SD	2831	CV	3.793
k hat (MLE)	0.763	k star (bias corrected MLE)	0.741
Theta hat (MLE)	978.3	Theta star (bias corrected MLE)	1007
nu hat (MLE)	114.4	nu star (bias corrected)	111.2
MLE Mean (bias corrected)	746.4	MLE Sd (bias corrected)	866.9
		Adjusted Level of Significance (β)	0.0468
Approximate Chi Square Value (111.19, α)	87.85	Adjusted Chi Square Value (111.19, β)	87.45
95% Gamma Approximate UCL (use when $n \geq 50$)	944.6	95% Gamma Adjusted UCL (use when $n < 50$)	949

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.198	Lilliefors GOF Test
5% Lilliefors Critical Value	0.103	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	747.4	Mean in Log Scale	5.952
SD in Original Scale	2831	SD in Log Scale	0.727
95% t UCL (assumes normality of ROS data)	1292	95% Percentile Bootstrap UCL	1402
95% BCA Bootstrap UCL	1797	95% Bootstrap t UCL	6637
95% H-UCL (Log ROS)	593.3		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	746.7
SD in Original Scale	2831
95% t UCL (Assumes normality)	1291

DL/2 Log-Transformed

Mean in Log Scale	5.938
SD in Log Scale	0.765
95% H-Stat UCL	609.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 1414

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

UCL Statistics for Data Sets with Non-Detects

User Selected Options
Date/Time of Computation 2/8/2016 7:50:27 PM
From File ProUCL_Input_b.xls
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

Trichloroethene

General Statistics

Total Number of Observations	210	Number of Distinct Observations	76
		Number of Missing Observations	1
Number of Detects	65	Number of Non-Detects	145
Number of Distinct Detects	41	Number of Distinct Non-Detects	49
Minimum Detect	0.71	Minimum Non-Detect	2.8
Maximum Detect	29	Maximum Non-Detect	280
Variance Detects	35.54	Percent Non-Detects	69.05%
Mean Detects	4.923	SD Detects	5.962
Median Detects	2.9	CV Detects	1.211
Skewness Detects	2.507	Kurtosis Detects	6.096
Mean of Logged Detects	1.136	SD of Logged Detects	0.899

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.646
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.286
5% Lilliefors Critical Value	0.11

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	3.028	Standard Error of Mean	0.277
SD	3.648	95% KM (BCA) UCL	3.537
95% KM (t) UCL	3.486	95% KM (Percentile Bootstrap) UCL	3.507
95% KM (z) UCL	3.484	95% KM Bootstrap t UCL	3.605
90% KM Chebyshev UCL	3.859	95% KM Chebyshev UCL	4.236
97.5% KM Chebyshev UCL	4.758	99% KM Chebyshev UCL	5.785

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.728
5% A-D Critical Value	0.775
K-S Test Statistic	0.158
5% K-S Critical Value	0.113

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.232	k star (bias corrected MLE)	1.186
Theta hat (MLE)	3.995	Theta star (bias corrected MLE)	4.153
nu hat (MLE)	160.2	nu star (bias corrected)	154.1
MLE Mean (bias corrected)	4.923	MLE Sd (bias corrected)	4.521

Gamma Kaplan-Meier (KM) Statistics

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

	k hat (KM)	0.689	nu hat (KM)	289.4
	Approximate Chi Square Value (289.41, α)	251	Adjusted Chi Square Value (289.41, β)	250.8
	95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3.491	95% Gamma Adjusted KM-UCL (use when $n < 50$)	3.495

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

	Minimum	0.01	Mean	2.677
	Maximum	29	Median	1.569
	SD	3.852	CV	1.439
	k hat (MLE)	0.581	k star (bias corrected MLE)	0.576
	Theta hat (MLE)	4.604	Theta star (bias corrected MLE)	4.645
	nu hat (MLE)	244.2	nu star (bias corrected)	242
	MLE Mean (bias corrected)	2.677	MLE Sd (bias corrected)	3.526
			Adjusted Level of Significance (β)	0.0489
	Approximate Chi Square Value (242.04, α)	207	Adjusted Chi Square Value (242.04, β)	206.8
	95% Gamma Approximate UCL (use when $n \geq 50$)	3.13	95% Gamma Adjusted UCL (use when $n < 50$)	3.133

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0878	Lilliefors GOF Test
5% Lilliefors Critical Value	0.11	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

	Mean in Original Scale	3.025	Mean in Log Scale	0.829
	SD in Original Scale	3.614	SD in Log Scale	0.641
95% t UCL (assumes normality of ROS data)		3.437	95% Percentile Bootstrap UCL	3.454
95% BCA Bootstrap UCL		3.537	95% Bootstrap t UCL	3.6
95% H-UCL (Log ROS)		3.06		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.801	95% H-UCL (KM -Log)	3.103
KM SD (logged)	0.693	95% Critical H Value (KM-Log)	1.916
KM Standard Error of Mean (logged)	0.0742		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	4.005	Mean in Log Scale	1.017
SD in Original Scale	10.07	SD in Log Scale	0.615
95% t UCL (Assumes normality)	5.153	95% H-Stat UCL	3.615

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	3.486	95% KM (% Bootstrap) UCL	3.507
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

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However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(a)anthracene

General Statistics

Total Number of Observations	211	Number of Distinct Observations	60
Number of Detects	96	Number of Non-Detects	115
Number of Distinct Detects	55	Number of Distinct Non-Detects	7
Minimum Detect	9.5	Minimum Non-Detect	170
Maximum Detect	9100	Maximum Non-Detect	230
Variance Detects	980971	Percent Non-Detects	54.5%
Mean Detects	251	SD Detects	990.4
Median Detects	32.5	CV Detects	3.947
Skewness Detects	7.867	Kurtosis Detects	68.75
Mean of Logged Detects	3.883	SD of Logged Detects	1.429

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.264
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.404
5% Lilliefors Critical Value	0.0904

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	134	Standard Error of Mean	46.67
SD	673.5	95% KM (BCA) UCL	222.4
95% KM (t) UCL	211.1	95% KM (Percentile Bootstrap) UCL	224.9
95% KM (z) UCL	210.8	95% KM Bootstrap t UCL	370.4
90% KM Chebyshev UCL	274	95% KM Chebyshev UCL	337.5
97.5% KM Chebyshev UCL	425.5	99% KM Chebyshev UCL	598.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	12.24
5% A-D Critical Value	0.843
K-S Test Statistic	0.292
5% K-S Critical Value	0.0979

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.401	k star (bias corrected MLE)	0.395
Theta hat (MLE)	626.4	Theta star (bias corrected MLE)	635.2
nu hat (MLE)	76.93	nu star (bias corrected)	75.86
MLE Mean (bias corrected)	251	MLE Sd (bias corrected)	399.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0396	nu hat (KM)	16.71
Approximate Chi Square Value (16.71, α)	8.467	Adjusted Chi Square Value (16.71, β)	8.427
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	264.5	95% Gamma Adjusted KM-UCL (use when $n < 50$)	265.8

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

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For such situations, GROS method tends to yield inflated values of UCLs and BTVs
 For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	159.2
Maximum	9100	Median	17
SD	682.9	CV	4.291
k hat (MLE)	0.179	k star (bias corrected MLE)	0.179
Theta hat (MLE)	889.9	Theta star (bias corrected MLE)	886.8
nu hat (MLE)	75.48	nu star (bias corrected)	75.74
MLE Mean (bias corrected)	159.2	MLE Sd (bias corrected)	375.7
		Adjusted Level of Significance (β)	0.0489
Approximate Chi Square Value (75.74, α)	56.69	Adjusted Chi Square Value (75.74, β)	56.58
95% Gamma Approximate UCL (use when $n \geq 50$)	212.6	95% Gamma Adjusted UCL (use when $n < 50$)	213

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.166	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0904	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	140.1	Mean in Log Scale	3.652
SD in Original Scale	674.6	SD in Log Scale	1.212
95% t UCL (assumes normality of ROS data)	216.8	95% Percentile Bootstrap UCL	223.9
95% BCA Bootstrap UCL	285	95% Bootstrap t UCL	351.7
95% H-UCL (Log ROS)	97.74		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	165.6
SD in Original Scale	670.7
95% t UCL (Assumes normality)	241.9

DL/2 Log-Transformed

Mean in Log Scale	4.244
SD in Log Scale	1.017
95% H-Stat UCL	136.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 222.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(a)pyrene

General Statistics

Total Number of Observations	200	Number of Distinct Observations	69
		Number of Missing Observations	11
Number of Detects	98	Number of Non-Detects	102
Number of Distinct Detects	65	Number of Distinct Non-Detects	7
Minimum Detect	9	Minimum Non-Detect	170
Maximum Detect	8900	Maximum Non-Detect	230
Variance Detects	929993	Percent Non-Detects	51%

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Mean Detects	248.2	SD Detects	964.4
Median Detects	35.5	CV Detects	3.885
Skewness Detects	7.839	Kurtosis Detects	68.49
Mean of Logged Detects	3.901	SD of Logged Detects	1.441

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.268
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.402
5% Lilliefors Critical Value	0.0895

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	141.7	Standard Error of Mean	48.41
SD	680.1	95% KM (BCA) UCL	233.4
95% KM (t) UCL	221.7	95% KM (Percentile Bootstrap) UCL	226.9
95% KM (z) UCL	221.3	95% KM Bootstrap t UCL	355.9
90% KM Chebyshev UCL	286.9	95% KM Chebyshev UCL	352.7
97.5% KM Chebyshev UCL	444	99% KM Chebyshev UCL	623.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	11.35
5% A-D Critical Value	0.841
K-S Test Statistic	0.261
5% K-S Critical Value	0.0968

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.407	k star (bias corrected MLE)	0.401
Theta hat (MLE)	610.3	Theta star (bias corrected MLE)	618.9
nu hat (MLE)	79.72	nu star (bias corrected)	78.61
MLE Mean (bias corrected)	248.2	MLE Sd (bias corrected)	391.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0434	nu hat (KM)	17.36
Approximate Chi Square Value (17.36, α)	8.929	Adjusted Chi Square Value (17.36, β)	8.885
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	275.4	95% Gamma Adjusted KM-UCL (use when $n < 50$)	276.8

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	163.8
Maximum	8900	Median	19
SD	688.7	CV	4.204
k hat (MLE)	0.19	k star (bias corrected MLE)	0.191
Theta hat (MLE)	860.2	Theta star (bias corrected MLE)	858.1
nu hat (MLE)	76.17	nu star (bias corrected)	76.36
MLE Mean (bias corrected)	163.8	MLE Sd (bias corrected)	374.9
		Adjusted Level of Significance (β)	0.0488
Approximate Chi Square Value (76.36, α)	57.23	Adjusted Chi Square Value (76.36, β)	57.11

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95% Gamma Approximate UCL (use when n>=50) 218.6

95% Gamma Adjusted UCL (use when n<50) 219

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.141	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0895	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	146.7	Mean in Log Scale	3.687
SD in Original Scale	681.3	SD in Log Scale	1.241
95% t UCL (assumes normality of ROS data)	226.3	95% Percentile Bootstrap UCL	235.6
95% BCA Bootstrap UCL	309	95% Bootstrap t UCL	371.9
95% H-UCL (Log ROS)	106.5		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	169.9
SD in Original Scale	677.7
95% t UCL (Assumes normality)	249.1

DL/2 Log-Transformed

Mean in Log Scale	4.231
SD in Log Scale	1.058
95% H-Stat UCL	142.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL 233.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Benzo(b)fluoranthene

General Statistics

Total Number of Observations	207	Number of Distinct Observations	84
		Number of Missing Observations	4
Number of Detects	119	Number of Non-Detects	88
Number of Distinct Detects	80	Number of Distinct Non-Detects	6
Minimum Detect	10	Minimum Non-Detect	170
Maximum Detect	11000	Maximum Non-Detect	220
Variance Detects	1285815	Percent Non-Detects	42.51%
Mean Detects	314.8	SD Detects	1134
Median Detects	50	CV Detects	3.602
Skewness Detects	7.697	Kurtosis Detects	68.55
Mean of Logged Detects	4.307	SD of Logged Detects	1.361

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.287	Normal GOF Test on Detected Observations Only
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level

Lilliefors Test Statistic	0.394	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0812	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

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ProUCL Output - Surface/Subsurface Soil
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Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	204.3	Standard Error of Mean	60.5
SD	866.1	95% KM (BCA) UCL	330.8
95% KM (t) UCL	304.2	95% KM (Percentile Bootstrap) UCL	312.3
95% KM (z) UCL	303.8	95% KM Bootstrap t UCL	436
90% KM Chebyshev UCL	385.8	95% KM Chebyshev UCL	468
97.5% KM Chebyshev UCL	582.1	99% KM Chebyshev UCL	806.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	13.43	Anderson-Darling GOF Test
5% A-D Critical Value	0.832	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.265	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.09	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)	0.447	k star (bias corrected MLE)	0.442
Theta hat (MLE)	703.7	Theta star (bias corrected MLE)	712.8
nu hat (MLE)	106.5	nu star (bias corrected)	105.1
MLE Mean (bias corrected)	314.8	MLE Sd (bias corrected)	473.7

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0556	nu hat (KM)	23.02
Approximate Chi Square Value (23.02, α)	13.11	Adjusted Chi Square Value (23.02, β)	13.06
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	358.7	95% Gamma Adjusted KM-UCL (use when $n < 50$)	360.2

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	222.5
Maximum	11000	Median	37
SD	873.8	CV	3.926
k hat (MLE)	0.209	k star (bias corrected MLE)	0.209
Theta hat (MLE)	1066	Theta star (bias corrected MLE)	1065
nu hat (MLE)	86.39	nu star (bias corrected)	86.47
MLE Mean (bias corrected)	222.5	MLE Sd (bias corrected)	486.9
		Adjusted Level of Significance (β)	0.0488
Approximate Chi Square Value (86.47, α)	66.03	Adjusted Chi Square Value (86.47, β)	65.91
95% Gamma Approximate UCL (use when $n \geq 50$)	291.4	95% Gamma Adjusted UCL (use when $n < 50$)	292

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.141	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0812	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	210.4	Mean in Log Scale	4.125
SD in Original Scale	867.6	SD in Log Scale	1.206
95% t UCL (assumes normality of ROS data)	310	95% Percentile Bootstrap UCL	319.8

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95% BCA Bootstrap UCL	389.2	95% Bootstrap t UCL	440.5
95% H-UCL (Log ROS)	155.6		

DL/2 Statistics			
DL/2 Normal			DL/2 Log-Transformed
Mean in Original Scale	221.1	Mean in Log Scale	4.409
SD in Original Scale	865.1	SD in Log Scale	1.037
95% t UCL (Assumes normality)	320.5	95% H-Stat UCL	164.6

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use
95% KM (Chebyshev) UCL 468

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

4,4'-DDE

General Statistics			
Total Number of Observations	144	Number of Distinct Observations	86
		Number of Missing Observations	5
Number of Detects	102	Number of Non-Detects	42
Number of Distinct Detects	78	Number of Distinct Non-Detects	11
Minimum Detect	1.1	Minimum Non-Detect	3.5
Maximum Detect	62000	Maximum Non-Detect	340
Variance Detects	38733426	Percent Non-Detects	29.17%
Mean Detects	1134	SD Detects	6224
Median Detects	115	CV Detects	5.489
Skewness Detects	9.481	Kurtosis Detects	93.08
Mean of Logged Detects	4.675	SD of Logged Detects	2.079

Normal GOF Test on Detects Only		Normal GOF Test on Detected Observations Only	
Shapiro Wilk Test Statistic	0.181	Detected Data Not Normal at 5% Significance Level	
5% Shapiro Wilk P Value	0		
Lilliefors Test Statistic	0.428	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.0877	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	803.9	Standard Error of Mean	438.6
SD	5238	95% KM (BCA) UCL	1749
95% KM (t) UCL	1530	95% KM (Percentile Bootstrap) UCL	1633
95% KM (z) UCL	1525	95% KM Bootstrap t UCL	5079
90% KM Chebyshev UCL	2120	95% KM Chebyshev UCL	2716
97.5% KM Chebyshev UCL	3543	99% KM Chebyshev UCL	5168

Gamma GOF Tests on Detected Observations Only		Anderson-Darling GOF Test
A-D Test Statistic	6.758	

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5% A-D Critical Value	0.871	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.0967	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)	0.293	k star (bias corrected MLE)	0.291
Theta hat (MLE)	3864	Theta star (bias corrected MLE)	3892
nu hat (MLE)	59.86	nu star (bias corrected)	59.43
MLE Mean (bias corrected)	1134	MLE Sd (bias corrected)	2101

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0236	nu hat (KM)	6.785
Approximate Chi Square Value (6.78, α)	2.053	Adjusted Chi Square Value (6.78, β)	2.027
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	2656	95% Gamma Adjusted KM-UCL (use when $n < 50$)	2691

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	803.1
Maximum	62000	Median	29
SD	5256	CV	6.544
k hat (MLE)	0.161	k star (bias corrected MLE)	0.162
Theta hat (MLE)	4984	Theta star (bias corrected MLE)	4945
nu hat (MLE)	46.4	nu star (bias corrected)	46.77
MLE Mean (bias corrected)	803.1	MLE Sd (bias corrected)	1993
		Adjusted Level of Significance (β)	0.0483
Approximate Chi Square Value (46.77, α)	32.08	Adjusted Chi Square Value (46.77, β)	31.95
95% Gamma Approximate UCL (use when $n \geq 50$)	1171	95% Gamma Adjusted UCL (use when $n < 50$)	1175

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0486	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0877	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	803.7	Mean in Log Scale	3.38
SD in Original Scale	5256	SD in Log Scale	2.738
95% t UCL (assumes normality of ROS data)	1529	95% Percentile Bootstrap UCL	1651
95% BCA Bootstrap UCL	2157	95% Bootstrap t UCL	4315
95% H-UCL (Log ROS)	3274		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.449	95% H-UCL (KM -Log)	2224
KM SD (logged)	2.6	95% Critical H Value (KM-Log)	4.035
KM Standard Error of Mean (logged)	0.228		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale 804.8

DL/2 Log-Transformed

Mean in Log Scale 3.524

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SD in Original Scale 5256	SD in Log Scale 2.535
95% t UCL (Assumes normality) 1530	95% H-Stat UCL 1951

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 3543

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

4,4'-DDT

General Statistics

Total Number of Observations	119	Number of Distinct Observations	73
		Number of Missing Observations	30
Number of Detects	70	Number of Non-Detects	49
Number of Distinct Detects	62	Number of Distinct Non-Detects	14
Minimum Detect	0.15	Minimum Non-Detect	3.3
Maximum Detect	29000	Maximum Non-Detect	350
Variance Detects	12886054	Percent Non-Detects	41.18%
Mean Detects	852.7	SD Detects	3590
Median Detects	110	CV Detects	4.21
Skewness Detects	7.3	Kurtosis Detects	56.83
Mean of Logged Detects	4.373	SD of Logged Detects	2.318

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.248
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.406
5% Lilliefors Critical Value	0.106

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	502.8	Standard Error of Mean	255.3
SD	2765	95% KM (BCA) UCL	1016
95% KM (t) UCL	926.1	95% KM (Percentile Bootstrap) UCL	960.1
95% KM (z) UCL	922.8	95% KM Bootstrap t UCL	2330
90% KM Chebyshev UCL	1269	95% KM Chebyshev UCL	1616
97.5% KM Chebyshev UCL	2097	99% KM Chebyshev UCL	3043

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.516
5% A-D Critical Value	0.87
K-S Test Statistic	0.161
5% K-S Critical Value	0.116

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

k hat (MLE)	0.292	k star (bias corrected MLE)	0.289
Theta hat (MLE)	2924	Theta star (bias corrected MLE)	2954
nu hat (MLE)	40.83	nu star (bias corrected)	40.42
MLE Mean (bias corrected)	852.7	MLE Sd (bias corrected)	1587

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0331	nu hat (KM)	7.87
Approximate Chi Square Value (7.87, α)	2.66	Adjusted Chi Square Value (7.87, β)	2.623
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1488	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1509

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	501.6
Maximum	29000	Median	5.8
SD	2777	CV	5.537
k hat (MLE)	0.14	k star (bias corrected MLE)	0.142
Theta hat (MLE)	3581	Theta star (bias corrected MLE)	3529
nu hat (MLE)	33.34	nu star (bias corrected)	33.83
MLE Mean (bias corrected)	501.6	MLE Sd (bias corrected)	1330
		Adjusted Level of Significance (β)	0.048
Approximate Chi Square Value (33.83, α)	21.53	Adjusted Chi Square Value (33.83, β)	21.41
95% Gamma Approximate UCL (use when $n \geq 50$)	788.2	95% Gamma Adjusted UCL (use when $n < 50$)	792.6

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0847	Lilliefors GOF Test
5% Lilliefors Critical Value	0.106	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	502.4	Mean in Log Scale	2.613
SD in Original Scale	2777	SD in Log Scale	2.884
95% t UCL (assumes normality of ROS data)	924.5	95% Percentile Bootstrap UCL	995.6
95% BCA Bootstrap UCL	1271	95% Bootstrap t UCL	2067
95% H-UCL (Log ROS)	2870		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.651	95% H-UCL (KM -Log)	2176
KM SD (logged)	2.797	95% Critical H Value (KM-Log)	4.363
KM Standard Error of Mean (logged)	0.308		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	505.2
SD in Original Scale	2777
95% t UCL (Assumes normality)	927.2

DL/2 Log-Transformed

Mean in Log Scale	2.904
SD in Log Scale	2.566
95% H-Stat UCL	1282

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 2097

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aldrin

General Statistics

Total Number of Observations	145	Number of Distinct Observations	71
		Number of Missing Observations	4
Number of Detects	80	Number of Non-Detects	65
Number of Distinct Detects	63	Number of Distinct Non-Detects	9
Minimum Detect	0.096	Minimum Non-Detect	1.7
Maximum Detect	92000	Maximum Non-Detect	4.1
Variance Detects	1.108E+8	Percent Non-Detects	44.83%
Mean Detects	2153	SD Detects	10526
Median Detects	210	CV Detects	4.89
Skewness Detects	8.149	Kurtosis Detects	69.52
Mean of Logged Detects	4.941	SD of Logged Detects	2.674

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.209
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.431
5% Lilliefors Critical Value	0.0991

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1188	Standard Error of Mean	655.4
SD	7843	95% KM (BCA) UCL	2589
95% KM (t) UCL	2273	95% KM (Percentile Bootstrap) UCL	2373
95% KM (z) UCL	2266	95% KM Bootstrap t UCL	6975
90% KM Chebyshev UCL	3154	95% KM Chebyshev UCL	4045
97.5% KM Chebyshev UCL	5281	99% KM Chebyshev UCL	7709

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.703
5% A-D Critical Value	0.886
K-S Test Statistic	0.196
5% K-S Critical Value	0.109

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.258	k star (bias corrected MLE)	0.257
Theta hat (MLE)	8328	Theta star (bias corrected MLE)	8372
nu hat (MLE)	41.36	nu star (bias corrected)	41.14
MLE Mean (bias corrected)	2153	MLE Sd (bias corrected)	4245

Gamma Kaplan-Meier (KM) Statistics

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

	k hat (KM)	0.0229		nu hat (KM)	6.652
	Approximate Chi Square Value (6.65, α)	1.982		Adjusted Chi Square Value (6.65, β)	1.956
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3987		95% Gamma Adjusted KM-UCL (use when $n < 50$)	4039	

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

	Minimum	0.01		Mean	1188
	Maximum	92000		Median	4.7
	SD	7870		CV	6.627
	k hat (MLE)	0.123		k star (bias corrected MLE)	0.125
	Theta hat (MLE)	9645		Theta star (bias corrected MLE)	9487
	nu hat (MLE)	35.71		nu star (bias corrected)	36.3
	MLE Mean (bias corrected)	1188		MLE Sd (bias corrected)	3357
				Adjusted Level of Significance (β)	0.0483
Approximate Chi Square Value (36.30, α)	23.51		Adjusted Chi Square Value (36.30, β)	23.41	
95% Gamma Approximate UCL (use when $n \geq 50$)	1834		95% Gamma Adjusted UCL (use when $n < 50$)	1842	

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0875	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0991	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1188	Mean in Log Scale	2.489
SD in Original Scale	7870	SD in Log Scale	3.593
95% t UCL (assumes normality of ROS data)	2270	95% Percentile Bootstrap UCL	2414
95% BCA Bootstrap UCL	3572	95% Bootstrap t UCL	7015
95% H-UCL (Log ROS)	37936		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.24	95% H-UCL (KM -Log)	37396
KM SD (logged)	3.646	95% Critical H Value (KM-Log)	5.412
KM Standard Error of Mean (logged)	0.359		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1188	Mean in Log Scale	2.715
SD in Original Scale	7870	SD in Log Scale	3.173
95% t UCL (Assumes normality)	2270	95% H-Stat UCL	8230

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 5281

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
 However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Alpha-Chlordane

General Statistics

Total Number of Observations	118	Number of Distinct Observations	38
		Number of Missing Observations	31
Number of Detects	27	Number of Non-Detects	91
Number of Distinct Detects	25	Number of Distinct Non-Detects	17
Minimum Detect	0.087	Minimum Non-Detect	1.7
Maximum Detect	20000	Maximum Non-Detect	190
Variance Detects	15244923	Percent Non-Detects	77.12%
Mean Detects	1359	SD Detects	3904
Median Detects	18	CV Detects	2.872
Skewness Detects	4.517	Kurtosis Detects	21.83
Mean of Logged Detects	4.057	SD of Logged Detects	3.053

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.385	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.364	Lilliefors GOF Test
5% Lilliefors Critical Value	0.171	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	311.7	Standard Error of Mean	180.1
SD	1920	95% KM (BCA) UCL	634.9
95% KM (t) UCL	610.2	95% KM (Percentile Bootstrap) UCL	634
95% KM (z) UCL	607.9	95% KM Bootstrap t UCL	1337
90% KM Chebyshev UCL	851.9	95% KM Chebyshev UCL	1097
97.5% KM Chebyshev UCL	1436	99% KM Chebyshev UCL	2103

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.448	Anderson-Darling GOF Test
5% A-D Critical Value	0.888	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.227	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.186	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)	0.228	k star (bias corrected MLE)	0.228
Theta hat (MLE)	5957	Theta star (bias corrected MLE)	5974
nu hat (MLE)	12.32	nu star (bias corrected)	12.29
MLE Mean (bias corrected)	1359	MLE Sd (bias corrected)	2850

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0264	nu hat (KM)	6.229
Approximate Chi Square Value (6.22, α)	1.754	Adjusted Chi Square Value (6.22, β)	1.725
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1105	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1124

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	311.1
Maximum	20000	Median	0.01
SD	1928	CV	6.197
k hat (MLE)	0.0974	k star (bias corrected MLE)	0.101
Theta hat (MLE)	3193	Theta star (bias corrected MLE)	3092
nu hat (MLE)	22.99	nu star (bias corrected)	23.74
MLE Mean (bias corrected)	311.1	MLE Sd (bias corrected)	980.8
		Adjusted Level of Significance (β)	0.048
Approximate Chi Square Value (23.74, α)	13.65	Adjusted Chi Square Value (23.74, β)	13.56
95% Gamma Approximate UCL (use when $n \geq 50$)	541	95% Gamma Adjusted UCL (use when $n < 50$)	544.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.955	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.167	Lilliefors GOF Test
5% Lilliefors Critical Value	0.171	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	311.4	Mean in Log Scale	-1.431
SD in Original Scale	1928	SD in Log Scale	4.135
95% t UCL (assumes normality of ROS data)	605.7	95% Percentile Bootstrap UCL	631.6
95% BCA Bootstrap UCL	945.4	95% Bootstrap t UCL	1284
95% H-UCL (Log ROS)	13076		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.0203	95% H-UCL (KM -Log)	188.8
KM SD (logged)	2.859	95% Critical H Value (KM-Log)	4.442
KM Standard Error of Mean (logged)	0.667		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	315.9	Mean in Log Scale	1.335
SD in Original Scale	1927	SD in Log Scale	2.314
95% t UCL (Assumes normality)	610	95% H-Stat UCL	122.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 1436

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

General Statistics

Total Number of Observations	211	Number of Distinct Observations	138
Number of Detects	178	Number of Non-Detects	33
Number of Distinct Detects	133	Number of Distinct Non-Detects	6
Minimum Detect	3.3	Minimum Non-Detect	34
Maximum Detect	7000000	Maximum Non-Detect	39
Variance Detects	3.263E+11	Percent Non-Detects	15.64%
Mean Detects	110321	SD Detects	571211
Median Detects	7000	CV Detects	5.178
Skewness Detects	10.47	Kurtosis Detects	122.1
Mean of Logged Detects	8.723	SD of Logged Detects	2.652

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.205
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.423
5% Lilliefors Critical Value	0.0664

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	93070	Standard Error of Mean	36224
SD	524701	95% KM (BCA) UCL	160196
95% KM (t) UCL	152916	95% KM (Percentile Bootstrap) UCL	155543
95% KM (z) UCL	152652	95% KM Bootstrap t UCL	262463
90% KM Chebyshev UCL	201741	95% KM Chebyshev UCL	250965
97.5% KM Chebyshev UCL	319287	99% KM Chebyshev UCL	453492

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	8.664
5% A-D Critical Value	0.896
K-S Test Statistic	0.157
5% K-S Critical Value	0.0762

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.246	k star (bias corrected MLE)	0.246
Theta hat (MLE)	447562	Theta star (bias corrected MLE)	448306
nu hat (MLE)	87.75	nu star (bias corrected)	87.61
MLE Mean (bias corrected)	110321	MLE Sd (bias corrected)	222391

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0315	nu hat (KM)	13.28
Approximate Chi Square Value (13.28, α)	6.08	Adjusted Chi Square Value (13.28, β)	6.046
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	203255	95% Gamma Adjusted KM-UCL (use when $n < 50$)	204382

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	93067
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Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Maximum	7000000	Median	3200
SD	525949	CV	5.651
k hat (MLE)	0.159	k star (bias corrected MLE)	0.16
Theta hat (MLE)	586374	Theta star (bias corrected MLE)	583057
nu hat (MLE)	66.98	nu star (bias corrected)	67.36
MLE Mean (bias corrected)	93067	MLE Sd (bias corrected)	232945
		Adjusted Level of Significance (β)	0.0489
Approximate Chi Square Value (67.36, α)	49.47	Adjusted Chi Square Value (67.36, β)	49.37
95% Gamma Approximate UCL (use when $n \geq 50$)	126721	95% Gamma Adjusted UCL (use when $n < 50$)	126990

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0469	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0664	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	93074	Mean in Log Scale	7.873
SD in Original Scale	525948	SD in Log Scale	3.166
95% t UCL (assumes normality of ROS data)	152894	95% Percentile Bootstrap UCL	157925
95% BCA Bootstrap UCL	199893	95% Bootstrap t UCL	267350
95% H-UCL (Log ROS)	1063557		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	7.747	95% H-UCL (KM -Log)	1802680
KM SD (logged)	3.335	95% Critical H Value (KM-Log)	4.762
KM Standard Error of Mean (logged)	0.237		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	93070
SD in Original Scale	525949
95% t UCL (Assumes normality)	152891

DL/2 Log-Transformed

Mean in Log Scale	7.813
SD in Log Scale	3.227
95% H-Stat UCL	1266244

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 319287

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aroclor 1254

General Statistics

Total Number of Observations	211	Number of Distinct Observations	70
Number of Detects	27	Number of Non-Detects	184
Number of Distinct Detects	26	Number of Distinct Non-Detects	50
Minimum Detect	3.5	Minimum Non-Detect	33
Maximum Detect	26000	Maximum Non-Detect	77000

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Variance Detects	34067377	Percent Non-Detects	87.2%
Mean Detects	2373	SD Detects	5837
Median Detects	160	CV Detects	2.459
Skewness Detects	3.371	Kurtosis Detects	11.57
Mean of Logged Detects	5.546	SD of Logged Detects	2.188

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.462	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.342	Lilliefors GOF Test
5% Lilliefors Critical Value	0.171	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	334.3	Standard Error of Mean	156.8
SD	2214	95% KM (BCA) UCL	628.7
95% KM (t) UCL	593.4	95% KM (Percentile Bootstrap) UCL	622.5
95% KM (z) UCL	592.2	95% KM Bootstrap t UCL	1306
90% KM Chebyshev UCL	804.8	95% KM Chebyshev UCL	1018
97.5% KM Chebyshev UCL	1314	99% KM Chebyshev UCL	1895

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.133	Anderson-Darling GOF Test
5% A-D Critical Value	0.851	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.282	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.182	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)	0.308	k star (bias corrected MLE)	0.299
Theta hat (MLE)	7697	Theta star (bias corrected MLE)	7944
nu hat (MLE)	16.65	nu star (bias corrected)	16.13
MLE Mean (bias corrected)	2373	MLE Sd (bias corrected)	4342

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0228	nu hat (KM)	9.623
Approximate Chi Square Value (9.62, α)	3.707	Adjusted Chi Square Value (9.62, β)	3.682
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	867.6	95% Gamma Adjusted KM-UCL (use when $n < 50$)	873.6

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	303.8
Maximum	26000	Median	0.01
SD	2202	CV	7.249
k hat (MLE)	0.0914	k star (bias corrected MLE)	0.0932
Theta hat (MLE)	3325	Theta star (bias corrected MLE)	3258
nu hat (MLE)	38.56	nu star (bias corrected)	39.35
MLE Mean (bias corrected)	303.8	MLE Sd (bias corrected)	994.9
		Adjusted Level of Significance (β)	0.0489

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Approximate Chi Square Value (39.35, α)	25.98	Adjusted Chi Square Value (39.35, β)	25.9
95% Gamma Approximate UCL (use when $n \geq 50$)	460.2	95% Gamma Adjusted UCL (use when $n < 50$)	461.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.945	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.171	Lilliefors GOF Test
5% Lilliefors Critical Value	0.171	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	318.7	Mean in Log Scale	2.417
SD in Original Scale	2200	SD in Log Scale	1.978
95% t UCL (assumes normality of ROS data)	568.9	95% Percentile Bootstrap UCL	606.6
95% BCA Bootstrap UCL	745	95% Bootstrap t UCL	1176
95% H-UCL (Log ROS)	121.6		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.217	95% H-UCL (KM -Log)	99.5
KM SD (logged)	1.493	95% Critical H Value (KM-Log)	2.607
KM Standard Error of Mean (logged)	0.382		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	959.1
SD in Original Scale	3934
95% t UCL (Assumes normality)	1407

DL/2 Log-Transformed

Mean in Log Scale	4.508
SD in Log Scale	1.869
95% H-Stat UCL	766.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 1314

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Delta-BHC

General Statistics

Total Number of Observations	122	Number of Distinct Observations	60
		Number of Missing Observations	26
Number of Detects	66	Number of Non-Detects	56
Number of Distinct Detects	55	Number of Distinct Non-Detects	8
Minimum Detect	0.34	Minimum Non-Detect	1.7
Maximum Detect	1400	Maximum Non-Detect	18
Variance Detects	85644	Percent Non-Detects	45.9%
Mean Detects	129.9	SD Detects	292.6
Median Detects	14	CV Detects	2.253
Skewness Detects	3.182	Kurtosis Detects	9.842

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
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Fairfield, New Jersey

Mean of Logged Detects	2.962	SD of Logged Detects	2.058
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Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.492
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.329
5% Lilliefors Critical Value	0.109

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	70.69	Standard Error of Mean	20.35
SD	223.1	95% KM (BCA) UCL	109
95% KM (t) UCL	104.4	95% KM (Percentile Bootstrap) UCL	106.7
95% KM (z) UCL	104.2	95% KM Bootstrap t UCL	123.8
90% KM Chebyshev UCL	131.7	95% KM Chebyshev UCL	159.4
97.5% KM Chebyshev UCL	197.8	99% KM Chebyshev UCL	273.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.245
5% A-D Critical Value	0.852
K-S Test Statistic	0.193
5% K-S Critical Value	0.118

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	0.353	k star (bias corrected MLE)	0.347
Theta hat (MLE)	368.2	Theta star (bias corrected MLE)	374.5
nu hat (MLE)	46.56	nu star (bias corrected)	45.77
MLE Mean (bias corrected)	129.9	MLE Sd (bias corrected)	220.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.1	nu hat (KM)	24.51
Approximate Chi Square Value (24.51, α)	14.24	Adjusted Chi Square Value (24.51, β)	14.14
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	121.7	95% Gamma Adjusted KM-UCL (use when $n < 50$)	122.5

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	70.27
Maximum	1400	Median	1.5
SD	224.1	CV	3.19
k hat (MLE)	0.16	k star (bias corrected MLE)	0.161
Theta hat (MLE)	439.6	Theta star (bias corrected MLE)	435.4
nu hat (MLE)	39	nu star (bias corrected)	39.38
MLE Mean (bias corrected)	70.27	MLE Sd (bias corrected)	174.9
		Adjusted Level of Significance (β)	0.048
Approximate Chi Square Value (39.38, α)	26	Adjusted Chi Square Value (39.38, β)	25.87
95% Gamma Approximate UCL (use when $n \geq 50$)	106.4	95% Gamma Adjusted UCL (use when $n < 50$)	106.9

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0973
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Lilliefors GOF Test

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5% Lilliefors Critical Value 0.109 Detected Data appear Lognormal at 5% Significance Level
Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	70.6	Mean in Log Scale	1.146
SD in Original Scale	224	SD in Log Scale	2.66
95% t UCL (assumes normality of ROS data)	104.2	95% Percentile Bootstrap UCL	105.4
95% BCA Bootstrap UCL	115.8	95% Bootstrap t UCL	118.1
95% H-UCL (Log ROS)	289		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.494	95% H-UCL (KM -Log)	108.2
KM SD (logged)	2.226	95% Critical H Value (KM-Log)	3.523
KM Standard Error of Mean (logged)	0.228		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	70.77
SD in Original Scale	224
95% t UCL (Assumes normality)	104.4

DL/2 Log-Transformed

Mean in Log Scale	1.606
SD in Log Scale	2.122
95% H-Stat UCL	91.21

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 197.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
 Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
 However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Dieldrin

General Statistics

Total Number of Observations	146	Number of Distinct Observations	104
		Number of Missing Observations	3
Number of Detects	117	Number of Non-Detects	29
Number of Distinct Detects	96	Number of Distinct Non-Detects	10
Minimum Detect	0.068	Minimum Non-Detect	3.5
Maximum Detect	99000	Maximum Non-Detect	4.5
Variance Detects	89568054	Percent Non-Detects	19.86%
Mean Detects	1809	SD Detects	9464
Median Detects	150	CV Detects	5.233
Skewness Detects	9.614	Kurtosis Detects	98.12
Mean of Logged Detects	4.842	SD of Logged Detects	2.502

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.196
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.424
5% Lilliefors Critical Value	0.0819

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

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ProUCL Output - Surface/Subsurface Soil
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Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1450	Standard Error of Mean	703.7
SD	8467	95% KM (BCA) UCL	3038
95% KM (t) UCL	2615	95% KM (Percentile Bootstrap) UCL	2798
95% KM (z) UCL	2607	95% KM Bootstrap t UCL	5809
90% KM Chebyshev UCL	3561	95% KM Chebyshev UCL	4517
97.5% KM Chebyshev UCL	5844	99% KM Chebyshev UCL	8452

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.062	Anderson-Darling GOF Test
5% A-D Critical Value	0.886	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.17	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.0931	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)	0.265	k star (bias corrected MLE)	0.264
Theta hat (MLE)	6831	Theta star (bias corrected MLE)	6860
nu hat (MLE)	61.95	nu star (bias corrected)	61.7
MLE Mean (bias corrected)	1809	MLE Sd (bias corrected)	3522

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0293	nu hat (KM)	8.56
Approximate Chi Square Value (8.56, α)	3.063	Adjusted Chi Square Value (8.56, β)	3.031
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	4051	95% Gamma Adjusted KM-UCL (use when $n < 50$)	4094

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1449
Maximum	99000	Median	76
SD	8496	CV	5.861
k hat (MLE)	0.174	k star (bias corrected MLE)	0.175
Theta hat (MLE)	8317	Theta star (bias corrected MLE)	8270
nu hat (MLE)	50.89	nu star (bias corrected)	51.18
MLE Mean (bias corrected)	1449	MLE Sd (bias corrected)	3462
		Adjusted Level of Significance (β)	0.0484
Approximate Chi Square Value (51.18, α)	35.75	Adjusted Chi Square Value (51.18, β)	35.62
95% Gamma Approximate UCL (use when $n \geq 50$)	2075	95% Gamma Adjusted UCL (use when $n < 50$)	2082

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0494	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0819	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1450	Mean in Log Scale	3.879
SD in Original Scale	8496	SD in Log Scale	2.992

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95% t UCL (assumes normality of ROS data)	2614	95% Percentile Bootstrap UCL	2722
95% BCA Bootstrap UCL	3534	95% Bootstrap t UCL	6141
95% H-UCL (Log ROS)	13135		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.668	95% H-UCL (KM -Log)	36029
KM SD (logged)	3.305	95% Critical H Value (KM-Log)	4.96
KM Standard Error of Mean (logged)	0.3		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	1450
SD in Original Scale	8496
95% t UCL (Assumes normality)	2614

DL/2 Log-Transformed

Mean in Log Scale	4.006
SD in Log Scale	2.801
95% H-Stat UCL	7559

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 5844

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Gamma-Chlordane

General Statistics

Total Number of Observations	147	Number of Distinct Observations	91
Number of Detects	120	Number of Missing Observations	2
Number of Distinct Detects	89	Number of Non-Detects	27
Minimum Detect	0.082	Number of Distinct Non-Detects	3
Maximum Detect	43000	Minimum Non-Detect	1.8
Variance Detects	16639906	Maximum Non-Detect	2
Mean Detects	792.1	Percent Non-Detects	18.37%
Median Detects	58	SD Detects	4079
Skewness Detects	9.604	CV Detects	5.15
Mean of Logged Detects	4.043	Kurtosis Detects	98.51
		SD of Logged Detects	2.375

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.201
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.423
5% Lilliefors Critical Value	0.0809

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	646.7	Standard Error of Mean	305
SD	3683	95% KM (BCA) UCL	1271
95% KM (t) UCL	1152	95% KM (Percentile Bootstrap) UCL	1205

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95% KM (z) UCL	1148	95% KM Bootstrap t UCL	2607
90% KM Chebyshev UCL	1562	95% KM Chebyshev UCL	1976
97.5% KM Chebyshev UCL	2552	99% KM Chebyshev UCL	3682

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.907	Anderson-Darling GOF Test
5% A-D Critical Value	0.884	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.18	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.0922	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)	0.267	k star (bias corrected MLE)	0.266
Theta hat (MLE)	2966	Theta star (bias corrected MLE)	2978
nu hat (MLE)	64.09	nu star (bias corrected)	63.83
MLE Mean (bias corrected)	792.1	MLE Sd (bias corrected)	1536

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0308	nu hat (KM)	9.066
Approximate Chi Square Value (9.07, α)	3.367	Adjusted Chi Square Value (9.07, β)	3.333
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	1741	95% Gamma Adjusted KM-UCL (use when $n < 50$)	1759

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	646.6
Maximum	43000	Median	27
SD	3696	CV	5.715
k hat (MLE)	0.185	k star (bias corrected MLE)	0.186
Theta hat (MLE)	3488	Theta star (bias corrected MLE)	3474
nu hat (MLE)	54.5	nu star (bias corrected)	54.72
MLE Mean (bias corrected)	646.6	MLE Sd (bias corrected)	1499
		Adjusted Level of Significance (β)	0.0484
Approximate Chi Square Value (54.72, α)	38.72	Adjusted Chi Square Value (54.72, β)	38.59
95% Gamma Approximate UCL (use when $n \geq 50$)	913.7	95% Gamma Adjusted UCL (use when $n < 50$)	916.9

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0569	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0809	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	646.7	Mean in Log Scale	3.171
SD in Original Scale	3696	SD in Log Scale	2.868
95% t UCL (assumes normality of ROS data)	1151	95% Percentile Bootstrap UCL	1207
95% BCA Bootstrap UCL	1628	95% Bootstrap t UCL	2507
95% H-UCL (Log ROS)	4131		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.166	95% H-UCL (KM -Log)	4127
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ProUCL Output - Surface/Subsurface Soil
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KM SD (logged)	2.87	95% Critical H Value (KM-Log)	4.388
KM Standard Error of Mean (logged)	0.258		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	646.8
SD in Original Scale	3696
95% t UCL (Assumes normality)	1151

DL/2 Log-Transformed

Mean in Log Scale	3.29
SD in Log Scale	2.672
95% H-Stat UCL	2374

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 2552

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor

General Statistics

Total Number of Observations	110	Number of Distinct Observations	58
		Number of Missing Observations	39
Number of Detects	56	Number of Non-Detects	54
Number of Distinct Detects	51	Number of Distinct Non-Detects	8
Minimum Detect	1	Minimum Non-Detect	1.7
Maximum Detect	65000	Maximum Non-Detect	3.8
Variance Detects	88758861	Percent Non-Detects	49.09%
Mean Detects	2754	SD Detects	9421
Median Detects	71	CV Detects	3.421
Skewness Detects	5.71	Kurtosis Detects	36.09
Mean of Logged Detects	4.875	SD of Logged Detects	2.727

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.331
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.385
5% Lilliefors Critical Value	0.118

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1403	Standard Error of Mean	654.5
SD	6802	95% KM (BCA) UCL	2742
95% KM (t) UCL	2488	95% KM (Percentile Bootstrap) UCL	2632
95% KM (z) UCL	2479	95% KM Bootstrap t UCL	4916
90% KM Chebyshev UCL	3366	95% KM Chebyshev UCL	4255
97.5% KM Chebyshev UCL	5490	99% KM Chebyshev UCL	7914

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.365
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Anderson-Darling GOF Test

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5% A-D Critical Value	0.896	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.213	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.131	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)	0.235	k star (bias corrected MLE)	0.235
Theta hat (MLE)	11697	Theta star (bias corrected MLE)	11733
nu hat (MLE)	26.37	nu star (bias corrected)	26.29
MLE Mean (bias corrected)	2754	MLE Sd (bias corrected)	5685

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0425	nu hat (KM)	9.353
Approximate Chi Square Value (9.35, α)	3.542	Adjusted Chi Square Value (9.35, β)	3.494
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	3704	95% Gamma Adjusted KM-UCL (use when $n < 50$)	3754

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1402
Maximum	65000	Median	1.45
SD	6834	CV	4.874
k hat (MLE)	0.114	k star (bias corrected MLE)	0.117
Theta hat (MLE)	12331	Theta star (bias corrected MLE)	12018
nu hat (MLE)	25.02	nu star (bias corrected)	25.67
MLE Mean (bias corrected)	1402	MLE Sd (bias corrected)	4105
		Adjusted Level of Significance (β)	0.0478
Approximate Chi Square Value (25.67, α)	15.12	Adjusted Chi Square Value (25.67, β)	15.02
95% Gamma Approximate UCL (use when $n \geq 50$)	2380	95% Gamma Adjusted UCL (use when $n < 50$)	2397

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.129	Lilliefors GOF Test
5% Lilliefors Critical Value	0.118	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1402	Mean in Log Scale	1.568
SD in Original Scale	6834	SD in Log Scale	4.177
95% t UCL (assumes normality of ROS data)	2483	95% Percentile Bootstrap UCL	2552
95% BCA Bootstrap UCL	3267	95% Bootstrap t UCL	4826
95% H-UCL (Log ROS)	352329		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.488	95% H-UCL (KM -Log)	6077
KM SD (logged)	3.103	95% Critical H Value (KM-Log)	4.739
KM Standard Error of Mean (logged)	0.299		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale 1403

DL/2 Log-Transformed

Mean in Log Scale 2.473

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SD in Original Scale 6834	SD in Log Scale 3.13
95% t UCL (Assumes normality) 2484	95% H-Stat UCL 6656

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 5490

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Heptachlor Epoxide

General Statistics

Total Number of Observations	63	Number of Distinct Observations	27
		Number of Missing Observations	80
Number of Detects	25	Number of Non-Detects	38
Number of Distinct Detects	22	Number of Distinct Non-Detects	5
Minimum Detect	0.59	Minimum Non-Detect	1.7
Maximum Detect	2900	Maximum Non-Detect	2.3
Variance Detects	333948	Percent Non-Detects	60.32%
Mean Detects	172.2	SD Detects	577.9
Median Detects	12	CV Detects	3.356
Skewness Detects	4.752	Kurtosis Detects	23.17
Mean of Logged Detects	2.948	SD of Logged Detects	2.008

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.313
5% Shapiro Wilk Critical Value	0.918
Lilliefors Test Statistic	0.383
5% Lilliefors Critical Value	0.177

Shapiro Wilk GOF Test

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	68.73	Standard Error of Mean	47.12
SD	366.4	95% KM (BCA) UCL	167.5
95% KM (t) UCL	147.4	95% KM (Percentile Bootstrap) UCL	158.2
95% KM (z) UCL	146.2	95% KM Bootstrap t UCL	621.4
90% KM Chebyshev UCL	210.1	95% KM Chebyshev UCL	274.1
97.5% KM Chebyshev UCL	363	99% KM Chebyshev UCL	537.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.157
5% A-D Critical Value	0.849
K-S Test Statistic	0.255
5% K-S Critical Value	0.189

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

k hat (MLE)	0.311	k star (bias corrected MLE)	0.301
Theta hat (MLE)	552.9	Theta star (bias corrected MLE)	572.6
nu hat (MLE)	15.57	nu star (bias corrected)	15.04
MLE Mean (bias corrected)	172.2	MLE Sd (bias corrected)	314

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0352	nu hat (KM)	4.434
Approximate Chi Square Value (4.43, α)	0.9	Adjusted Chi Square Value (4.43, β)	0.865
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	338.6	95% Gamma Adjusted KM-UCL (use when $n < 50$)	352.4

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	68.34
Maximum	2900	Median	0.01
SD	369.4	CV	5.406
k hat (MLE)	0.134	k star (bias corrected MLE)	0.138
Theta hat (MLE)	510.3	Theta star (bias corrected MLE)	494.7
nu hat (MLE)	16.88	nu star (bias corrected)	17.4
MLE Mean (bias corrected)	68.34	MLE Sd (bias corrected)	183.9
		Adjusted Level of Significance (β)	0.0462
Approximate Chi Square Value (17.40, α)	8.962	Adjusted Chi Square Value (17.40, β)	8.82
95% Gamma Approximate UCL (use when $n \geq 50$)	132.7	95% Gamma Adjusted UCL (use when $n < 50$)	134.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.962	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.176	Lilliefors GOF Test
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	68.7	Mean in Log Scale	0.281
SD in Original Scale	369.4	SD in Log Scale	2.834
95% t UCL (assumes normality of ROS data)	146.4	95% Percentile Bootstrap UCL	159.7
95% BCA Bootstrap UCL	216.8	95% Bootstrap t UCL	627
95% H-UCL (Log ROS)	282.7		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.916	95% H-UCL (KM -Log)	47.93
KM SD (logged)	2.064	95% Critical H Value (KM-Log)	3.142
KM Standard Error of Mean (logged)	0.27		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	68.91	Mean in Log Scale	1.135
SD in Original Scale	369.3	SD in Log Scale	1.939
95% t UCL (Assumes normality)	146.6	95% H-Stat UCL	42.77

DL/2 is not a recommended method, provided for comparisons and historical reasons

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Nonparametric Distribution Free UCL Statistics
Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL 363

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	211	Number of Distinct Observations	61
Number of Detects	186	Number of Non-Detects	25
Number of Distinct Detects	61	Number of Distinct Non-Detects	6
Minimum Detect	0.48	Minimum Non-Detect	2.5
Maximum Detect	11.4	Maximum Non-Detect	3
Variance Detects	3.795	Percent Non-Detects	11.85%
Mean Detects	2.904	SD Detects	1.948
Median Detects	2.4	CV Detects	0.671
Skewness Detects	2.073	Kurtosis Detects	4.872
Mean of Logged Detects	0.893	SD of Logged Detects	0.576

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.787
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.204
5% Lilliefors Critical Value	0.065

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.771	Standard Error of Mean	0.13
SD	1.869	95% KM (BCA) UCL	2.989
95% KM (t) UCL	2.986	95% KM (Percentile Bootstrap) UCL	2.987
95% KM (z) UCL	2.985	95% KM Bootstrap t UCL	2.998
90% KM Chebyshev UCL	3.161	95% KM Chebyshev UCL	3.337
97.5% KM Chebyshev UCL	3.582	99% KM Chebyshev UCL	4.063

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.005
5% A-D Critical Value	0.76
K-S Test Statistic	0.123
5% K-S Critical Value	0.0677

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

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)	3.049	k star (bias corrected MLE)	3.003
Theta hat (MLE)	0.953	Theta star (bias corrected MLE)	0.967
nu hat (MLE)	1134	nu star (bias corrected)	1117
MLE Mean (bias corrected)	2.904	MLE Sd (bias corrected)	1.676

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.199	nu hat (KM)	928
Approximate Chi Square Value (927.99, α)	858.3	Adjusted Chi Square Value (927.99, β)	857.8
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	2.997	95% Gamma Adjusted KM-UCL (use when $n < 50$)	2.998

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.48	Mean	2.755
Maximum	11.4	Median	2.3
SD	1.886	CV	0.684
k hat (MLE)	2.975	k star (bias corrected MLE)	2.936
Theta hat (MLE)	0.926	Theta star (bias corrected MLE)	0.938
nu hat (MLE)	1255	nu star (bias corrected)	1239
MLE Mean (bias corrected)	2.755	MLE Sd (bias corrected)	1.608
		Adjusted Level of Significance (β)	0.0489
Approximate Chi Square Value (N/A, α)	1158	Adjusted Chi Square Value (N/A, β)	1158
95% Gamma Approximate UCL (use when $n \geq 50$)	2.947	95% Gamma Adjusted UCL (use when $n < 50$)	2.949

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0859	Lilliefors GOF Test
5% Lilliefors Critical Value	0.065	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.77	Mean in Log Scale	0.851
SD in Original Scale	1.871	SD in Log Scale	0.561
95% t UCL (assumes normality of ROS data)	2.983	95% Percentile Bootstrap UCL	2.988
95% BCA Bootstrap UCL	3.006	95% Bootstrap t UCL	3.003
95% H-UCL (Log ROS)	2.943		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.849	95% H-UCL (KM -Log)	2.949
KM SD (logged)	0.567	95% Critical H Value (KM-Log)	1.839
KM Standard Error of Mean (logged)	0.0402		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	2.72
SD in Original Scale	1.897
95% t UCL (Assumes normality)	2.936

DL/2 Log-Transformed

Mean in Log Scale	0.823
SD in Log Scale	0.574
95% H-Stat UCL	2.889

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	2.989
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
 However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium

General Statistics

Total Number of Observations	211	Number of Distinct Observations	147
		Number of Missing Observations	0
Minimum	8.1	Mean	29.48
Maximum	690	Median	21.6
SD	50.12	Std. Error of Mean	3.45
Coefficient of Variation	1.7	Skewness	11.26

Normal GOF Test

Shapiro Wilk Test Statistic	0.274
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.352
5% Lilliefors Critical Value	0.061

Shapiro Wilk GOF Test

Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL

95% Student's-t UCL	35.18
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95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995)	38.02
95% Modified-t UCL (Johnson-1978)	35.63

Gamma GOF Test

A-D Test Statistic	4.739E+28
5% A-D Critical Value	0.765
K-S Test Statistic	0.224
5% K-S Critical Value	0.0631

Anderson-Darling Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.179
Theta hat (MLE)	13.53
nu hat (MLE)	919.6
MLE Mean (bias corrected)	29.48
Adjusted Level of Significance	0.0489

k star (bias corrected MLE)	2.151
Theta star (bias corrected MLE)	13.7
nu star (bias corrected)	907.9
MLE Sd (bias corrected)	20.1
Approximate Chi Square Value (0.05)	838.9
Adjusted Chi Square Value	838.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	31.9
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95% Adjusted Gamma UCL (use when n<50)	31.92
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Lognormal GOF Test

Shapiro Wilk Test Statistic	0.869
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.132
5% Lilliefors Critical Value	0.061

Shapiro Wilk Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Lilliefors Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.092
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Mean of logged Data	3.137
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Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Maximum of Logged Data 6.537 SD of logged Data 0.538

Assuming Lognormal Distribution

95% H-UCL	28.5	90% Chebyshev (MVUE) UCL	29.77
95% Chebyshev (MVUE) UCL	31.2	97.5% Chebyshev (MVUE) UCL	33.18
99% Chebyshev (MVUE) UCL	37.08		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	35.16	95% Jackknife UCL	35.18
95% Standard Bootstrap UCL	35.22	95% Bootstrap-t UCL	43.59
95% Hall's Bootstrap UCL	56.64	95% Percentile Bootstrap UCL	35.64
95% BCA Bootstrap UCL	39.93		
90% Chebyshev(Mean, Sd) UCL	39.83	95% Chebyshev(Mean, Sd) UCL	44.52
97.5% Chebyshev(Mean, Sd) UCL	51.03	99% Chebyshev(Mean, Sd) UCL	63.81

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 44.52

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulation results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	211	Number of Distinct Observations	158
		Number of Missing Observations	0
Minimum	13800	Mean	28598
Maximum	118000	Median	27800
SD	9872	Std. Error of Mean	679.6
Coefficient of Variation	0.345	Skewness	3.817

Normal GOF Test

Shapiro Wilk Test Statistic	0.802
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.109
5% Lilliefors Critical Value	0.061

Shapiro Wilk GOF Test

Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL

95% Student's-t UCL 29721

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL (Chen-1995) 29906

95% Modified-t UCL (Johnson-1978) 29750

Gamma GOF Test

A-D Test Statistic	1.125
5% A-D Critical Value	0.752
K-S Test Statistic	0.0713

Anderson-Darling Gamma GOF Test

Data Not Gamma Distributed at 5% Significance Level

Kolmogorov-Smirnov Gamma GOF Test

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

5% K-S Critical Value 0.0623 Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	11.28	k star (bias corrected MLE)	11.12
Theta hat (MLE)	2536	Theta star (bias corrected MLE)	2572
nu hat (MLE)	4758	nu star (bias corrected)	4692
MLE Mean (bias corrected)	28598	MLE Sd (bias corrected)	8576
		Approximate Chi Square Value (0.05)	4534
Adjusted Level of Significance	0.0489	Adjusted Chi Square Value	4533

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	29595	95% Adjusted Gamma UCL (use when n<50)	29602
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Lognormal GOF Test

Shapiro Wilk Test Statistic	0.975
5% Shapiro Wilk P Value	0.0734
Lilliefors Test Statistic	0.0643
5% Lilliefors Critical Value	0.061

Shapiro Wilk Lognormal GOF Test

Data appear Lognormal at 5% Significance Level

Lilliefors Lognormal GOF Test

Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	9.532	Mean of logged Data	10.22
Maximum of Logged Data	11.68	SD of logged Data	0.292

Assuming Lognormal Distribution

95% H-UCL	29529	90% Chebyshev (MVUE) UCL	30275
95% Chebyshev (MVUE) UCL	31069	97.5% Chebyshev (MVUE) UCL	32172
99% Chebyshev (MVUE) UCL	34337		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	29716	95% Jackknife UCL	29721
95% Standard Bootstrap UCL	29707	95% Bootstrap-t UCL	29945
95% Hall's Bootstrap UCL	30276	95% Percentile Bootstrap UCL	29800
95% BCA Bootstrap UCL	29976		
90% Chebyshev(Mean, Sd) UCL	30637	95% Chebyshev(Mean, Sd) UCL	31560
97.5% Chebyshev(Mean, Sd) UCL	32842	99% Chebyshev(Mean, Sd) UCL	35360

Suggested UCL to Use

95% Student's-t UCL 29721

or 95% Modified-t UCL 29750

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	209	Number of Distinct Observations	177
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Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Number of Detects	208	Number of Missing Observations	2
Number of Distinct Detects	176	Number of Non-Detects	1
Minimum Detect	69.8	Number of Distinct Non-Detects	1
Maximum Detect	24800	Minimum Non-Detect	57.3
Variance Detects	2951493	Maximum Non-Detect	57.3
Mean Detects	554.9	Percent Non-Detects	0.478%
Median Detects	403	SD Detects	1718
Skewness Detects	13.74	CV Detects	3.096
Mean of Logged Detects	5.959	Kurtosis Detects	194.3
		SD of Logged Detects	0.598

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.149
5% Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.419
5% Lilliefors Critical Value	0.0614

Normal GOF Test on Detected Observations Only

Detected Data Not Normal at 5% Significance Level

Lilliefors GOF Test

Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	552.5	Standard Error of Mean	118.6
SD	1710	95% KM (BCA) UCL	789.5
95% KM (t) UCL	748.4	95% KM (Percentile Bootstrap) UCL	786.9
95% KM (z) UCL	747.5	95% KM Bootstrap t UCL	1669
90% KM Chebyshev UCL	908.2	95% KM Chebyshev UCL	1069
97.5% KM Chebyshev UCL	1293	99% KM Chebyshev UCL	1732

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.808E+28
5% A-D Critical Value	0.771
K-S Test Statistic	0.239
5% K-S Critical Value	0.0639

Anderson-Darling GOF Test

Detected Data Not Gamma Distributed at 5% Significance Level

Kolmogrov-Smirnoff GOF

Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.536	k star (bias corrected MLE)	1.517
Theta hat (MLE)	361.3	Theta star (bias corrected MLE)	365.8
nu hat (MLE)	638.8	nu star (bias corrected)	630.9
MLE Mean (bias corrected)	554.9	MLE Sd (bias corrected)	450.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.104	nu hat (KM)	43.63
Approximate Chi Square Value (43.63, α)	29.48	Adjusted Chi Square Value (43.63, β)	29.4
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	817.6	95% Gamma Adjusted KM-UCL (use when $n < 50$)	819.8

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	552.2
Maximum	24800	Median	402
SD	1714	CV	3.104
k hat (MLE)	1.376	k star (bias corrected MLE)	1.36

Appendix C-3
ProUCL Output - Surface/Subsurface Soil
Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

Theta hat (MLE)	401.3	Theta star (bias corrected MLE)	406.2
nu hat (MLE)	575.2	nu star (bias corrected)	568.3
MLE Mean (bias corrected)	552.2	MLE Sd (bias corrected)	473.6
		Adjusted Level of Significance (β)	0.0489
Approximate Chi Square Value (568.31, α)	514	Adjusted Chi Square Value (568.31, β)	513.7
95% Gamma Approximate UCL (use when $n \geq 50$)	610.5	95% Gamma Adjusted UCL (use when $n < 50$)	611

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.114	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0614	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	552.6	Mean in Log Scale	5.951
SD in Original Scale	1714	SD in Log Scale	0.607
95% t UCL (assumes normality of ROS data)	748.5	95% Percentile Bootstrap UCL	787.6
95% BCA Bootstrap UCL	921.4	95% Bootstrap t UCL	1668
95% H-UCL (Log ROS)	499.5		

DL/2 Statistics

DL/2 Normal

Mean in Original Scale	552.3
SD in Original Scale	1714
95% t UCL (Assumes normality)	748.3

DL/2 Log-Transformed

Mean in Log Scale	5.947
SD in Log Scale	0.623
95% H-Stat UCL	503.4

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	789.5
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Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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Appendix D

RAGS D Tables – CTE Scenario

Table D-1 Calculation of Chemical Cancer Risks and Noncancer Hazards – Central Tendency Exposure

- D-1.1 Current Worker
- D-1.2 Current Trespasser (Adult)
- D-1.3 Future Worker
- D-1.4 Future Trespasser (Adult)

Table D-2 Summary of Receptor Risks and Hazards for Chemical of Potential Concerns – Central Tendency Exposure

- D-2.1 Current Worker
- D-2.2 Current Trespasser (Adult)
- D-2.3 Future Worker
- D-2.4 Future Trespasser (Adult)

Table D-3 Risk Assessment Summary – Central Tendency Exposure

- D-3.1 Current Worker
- D-3.2 Current Trespasser (Adult)
- D-3.3 Future Worker
- D-3.4 Future Trespasser (Adult)

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TABLE D-1.1
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
					Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RID/RIC		Hazard Quotient		
					Value	Unit	Value	Unit		Value	Unit	Value	Unit			
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	2.10E-10	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	9.65E-12	1.63E-09	mg/kg-day	5.00E-04	mg/kg-day	3.26E-06
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	4.60E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	3.35E-07	3.57E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	7.37E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	5.38E-08	5.73E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	2.78E-07	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	4.73E-06	2.17E-06	mg/kg-day	3.00E-05	mg/kg-day	7.22E-02
				Aroclor 1248	3.89E+02	mg/kg	3.75E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	7.50E-05	2.92E-04	mg/kg-day	2.00E-05	mg/kg-day	1.46E+01
				Aroclor 1254	7.67E-01	mg/kg	7.40E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.48E-07	5.75E-07	mg/kg-day	2.00E-05	mg/kg-day	2.88E-02
				Dieldrin	3.73E+00	mg/kg	3.60E-07	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	5.75E-06	2.80E-06	mg/kg-day	5.00E-05	mg/kg-day	5.59E-02
				Gamma-Chlordane	1.73E+00	mg/kg	1.67E-07	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	5.84E-08	1.30E-06	mg/kg-day	5.00E-04	mg/kg-day	2.60E-03
				Heptachlor	7.07E+00	mg/kg	6.81E-07	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	3.07E-06	5.30E-06	mg/kg-day	5.00E-04	mg/kg-day	1.06E-02
				Heptachlor Epoxide	2.30E+00	mg/kg	2.22E-07	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	2.02E-06	1.73E-06	mg/kg-day	1.30E-05	mg/kg-day	1.33E-01
				Inorganics Arsenic	4.42E+00	mg/kg	2.56E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	3.84E-07	1.99E-06	mg/kg-day	3.00E-04	mg/kg-day	6.64E-03
				Chromium	1.06E+02	mg/kg	1.02E-05	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	5.10E-06	7.93E-05	mg/kg-day	3.00E-03	mg/kg-day	2.64E-02
				Manganese	3.16E+03	mg/kg	3.04E-04	mg/kg-day	NA	NA	NA	2.37E-03	mg/kg-day	1.40E-01	mg/kg-day	1.69E-02
				Exp. Route Total							9.67E-05					1.49E+01
Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	2.49E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	1.82E-07	1.93E-07	mg/kg-day	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	3.99E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	2.91E-08	3.10E-07	mg/kg-day	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA
				Aroclor 1248	3.89E+02	mg/kg	2.19E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.37E-05	1.70E-04	mg/kg-day	2.00E-05	mg/kg-day	8.51E+00
				Aroclor 1254	7.67E-01	mg/kg	4.31E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	8.62E-08	3.35E-07	mg/kg-day	2.00E-05	mg/kg-day	1.68E-02
				Dieldrin	3.73E+00	mg/kg	NA	NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA
				Gamma-Chlordane	1.73E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor	7.07E+00	mg/kg	NA	NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA
				Heptachlor Epoxide	2.30E+00	mg/kg	NA	NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA
				Inorganics Arsenic	4.42E+00	mg/kg	5.33E-08	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	7.99E-08	4.14E-07	mg/kg-day	3.00E-04	mg/kg-day	1.38E-03
				Chromium	1.06E+02	mg/kg	NA	NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA
				Manganese	3.16E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA
				Exp. Route Total							4.41E-05					8.52E+00
Surface Soil	Surface Soil	Surface Soil	Inhalation	Volatile Organic Compounds Trichloroethene	2.18E-03	mg/kg	1.16E-05	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	4.76E-11	9.03E-08	mg/m ³	2.00E-03	mg/m ³	4.51E-05
				Semi-volatile Organic Compounds Benzo(a)pyrene	4.77E-01	mg/kg	4.51E-09	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	4.96E-12	3.50E-11	mg/m ³	NA	NA	NA
				Benzo(b)fluoranthene	7.65E-01	mg/kg	7.23E-09	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	7.95E-13	5.62E-11	mg/m ³	NA	NA	NA
				Pesticides/Polychlorinated Biphenyls Aldrin	2.89E+00	mg/kg	1.98E-05	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	9.72E-08	1.54E-07	mg/m ³	NA	NA	NA
				Aroclor 1248	3.89E+02	mg/kg	7.33E-03	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	4.18E-06	5.70E-05	mg/m ³	NA	NA	NA
				Aroclor 1254	7.67E-01	mg/kg	1.07E-05	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	6.11E-09	8.33E-08	mg/m ³	NA	NA	NA
				Dieldrin	3.73E+00	mg/kg	3.53E-08	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	1.62E-10	2.74E-10	mg/m ³	NA	NA	NA
				Gamma-Chlordane	1.73E+00	mg/kg	1.64E-08	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	1.64E-12	1.27E-10	mg/m ³	7.00E-04	mg/m ³	1.82E-07
				Heptachlor	7.07E+00	mg/kg	1.74E-04	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	2.26E-07	1.35E-06	mg/m ³	NA	NA	NA
				Heptachlor Epoxide	2.30E+00	mg/kg	3.22E-05	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	8.37E-08	2.50E-07	mg/m ³	NA	NA	NA
				Inorganics Arsenic	4.42E+00	mg/kg	4.18E-08	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	1.80E-10	3.25E-10	mg/m ³	1.50E-05	mg/m ³	2.17E-05
				Chromium	1.06E+02	mg/kg	9.99E-07	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	1.20E-08	7.77E-09	mg/m ³	1.00E-04	mg/m ³	7.77E-05
				Manganese	3.16E+03	mg/kg	2.98E-05	µg/m ³	NA	NA	NA	2.32E-07	mg/m ³	5.00E-05	mg/m ³	4.64E-03
				Exp. Route Total							4.60E-06					4.79E-03
				Exposure Point Total							1.45E-04					2.35E+01

NA = not applicable

RID = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

TABLE D-1.2
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation				
					Value		Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Unit	Value	Unit	Value	Unit	Risk	Value	Unit	Value	Unit	Quotient
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatile Organic Compounds Trichloroethene Semi-volatile Organic Compounds Benzo(a)pyrene Benzo(b)fluoranthene Pesticides/Polychlorinated Biphenyls Aldrin Aroclor 1248 Aroclor 1254 Dieldrin Gamma-Chlordane Heptachlor Heptachlor Epoxide Inorganics Arsenic Chromium Manganese	2.18E-03 4.77E-01 7.65E-01 2.89E+00 3.89E+02 7.67E-01 3.73E+00 1.73E+00 7.07E+00 2.30E+00 4.42E+00 1.06E+02 3.16E+03	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	4.26E-11 9.33E-09 1.50E-08 5.65E-08 7.61E-06 1.50E-08 7.30E-08 3.39E-08 1.38E-07 4.50E-07 5.19E-08 2.07E-06 6.18E-05	mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day	4.60E-02 7.30E+00 7.30E-01 1.70E+01 2.00E+00 2.00E+00 1.60E+01 3.50E-01 4.50E+00 9.10E+00 1.50E+00 5.00E-01 NA	(mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ NA	1.96E-12 6.81E-08 1.09E-08 9.61E-07 1.52E-05 3.00E-08 1.17E-06 1.18E-08 6.22E-07 4.10E-07 7.79E-08 1.03E-06 NA	3.72E-10 8.16E-08 1.31E-07 4.95E-07 6.66E-05 1.31E-07 6.39E-07 2.96E-07 1.21E-06 3.94E-07 4.55E-07 1.81E-05 5.40E-04	mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day	5.00E-04 NA NA 3.00E-05 2.00E-05 2.00E-05 5.00E-05 5.00E-04 5.00E-04 1.30E-05 3.00E-04 3.00E-03 1.40E-01	mg/kg-day NA NA mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day	7.45E-07 NA NA 1.65E-02 3.33E+00 6.57E-03 1.28E-02 5.92E-04 2.42E-03 3.03E-02 1.52E-03 6.03E-03 3.86E-03
Exp. Route Total											1.96E-05				3.41E+00	
Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatile Organic Compounds Trichloroethene Semi-volatile Organic Compounds Benzo(a)pyrene Benzo(b)fluoranthene Pesticides/Polychlorinated Biphenyls Aldrin Aroclor 1248 Aroclor 1254 Dieldrin Gamma-Chlordane Heptachlor Heptachlor Epoxide Inorganics Arsenic Chromium Manganese	2.18E-03 4.77E-01 7.65E-01 2.89E+00 3.89E+02 7.67E-01 3.73E+00 1.73E+00 7.07E+00 2.30E+00 4.42E+00 1.06E+02 3.16E+03	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	NA 1.46E-08 2.35E-08 NA 1.29E-05 2.53E-08 NA NA NA NA NA NA 3.13E-08 NA NA	NA mg/kg-day mg/kg-day NA mg/kg-day mg/kg-day NA NA NA NA NA mg/kg-day NA NA NA	4.60E-02 7.30E+00 7.30E-01 1.70E+01 2.00E+00 2.00E+00 1.60E+01 3.50E-01 4.50E+00 9.10E+00 1.50E+00 5.00E-01 NA	(mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ (mg/kg-day) ⁻¹ NA	NA 1.07E-07 1.71E-08 NA 2.57E-05 5.07E-08 NA NA NA NA NA 4.70E-08 NA NA NA	NA 1.28E-07 2.05E-07 NA 1.13E-04 2.22E-07 NA NA NA NA NA 2.74E-07 NA NA NA	mg/kg-day mg/kg-day mg/kg-day NA mg/kg-day mg/kg-day NA NA NA NA NA mg/kg-day NA NA NA	5.00E-04 NA NA 3.00E-05 2.00E-05 2.00E-05 5.00E-04 5.00E-04 1.30E-05 3.00E-04 7.50E-05 5.60E-03	mg/kg-day NA NA mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day mg/kg-day	NA NA NA NA 5.63E+00 1.11E-02 NA NA NA NA NA 9.14E-04 NA NA NA
Exp. Route Total											2.59E-05				5.64E+00	
Surface Soil	Surface Soil	Surface Soil	Inhalation	Volatile Organic Compounds Trichloroethene Semi-volatile Organic Compounds Benzo(a)pyrene Benzo(b)fluoranthene Pesticides/Polychlorinated Biphenyls Aldrin Aroclor 1248 Aroclor 1254 Dieldrin Gamma-Chlordane Heptachlor Heptachlor Epoxide Inorganics Arsenic Chromium Manganese	2.18E-03 4.77E-01 7.65E-01 2.89E+00 3.89E+02 7.67E-01 3.73E+00 1.73E+00 7.07E+00 2.30E+00 4.42E+00 1.06E+02 3.16E+03	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	5.89E-07 2.29E-10 3.67E-10 1.01E-06 3.72E-04 5.44E-07 1.79E-09 8.30E-10 8.81E-06 1.63E-06 2.12E-09 5.07E-08 1.51E-06	µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³ µg/m ³	4.10E-06 1.10E-03 1.10E-04 4.90E-03 5.70E-04 5.70E-04 4.60E-03 1.00E-04 1.30E-03 2.60E-03 4.30E-03 1.20E-02 NA	(µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ (µg/m ³) ⁻¹ NA	2.41E-12 2.51E-13 4.03E-14 4.93E-09 5.70E-04 3.10E-10 8.23E-12 8.30E-14 1.15E-08 4.25E-09 9.12E-12 6.08E-10 NA	9.03E-07 3.50E-10 5.62E-10 1.54E-06 5.70E-04 8.33E-07 2.74E-09 1.27E-09 1.35E-05 2.50E-06 3.25E-09 7.77E-08 2.32E-06	mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³ mg/m ³	2.00E-03 NA NA NA NA NA NA 2.00E-04 NA NA 2.00E-04 3.00E-04 1.70E-04	mg/m ³ NA NA NA NA NA NA mg/m ³ NA NA mg/m ³ mg/m ³ mg/m ³	4.51E-04 NA NA NA NA NA NA 6.36E-06 NA NA 1.63E-05 2.59E-04 1.37E-02
Exp. Route Total											2.33E-07				1.44E-02	
Exposure Point Total											4.58E-05				9.06E+00	

NA = not applicable

RfD = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

**TABLE D-1.3
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE**

Unimatic Manufacturing Corporation Superfund Site
Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation				Noncancer Hazard Calculation						
					Value	Unit	Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RID/RIC		Hazard Quotient	
							Value	Unit	Value	Unit		Value	Unit	Value	Unit		
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatle Organic Compounds	2.80E-03	mg/kg	2.70E-10	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	1.24E-11	2.10E-09	mg/kg-day	5.00E-04	mg/kg-day	4.20E-06	
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	3.27E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	2.39E-07	2.54E-07	mg/kg-day	NA	NA	NA	
				Benzo(a)pyrene	5.25E-01	mg/kg	5.07E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	3.70E-08	3.94E-07	mg/kg-day	NA	NA	NA	
				Pesticides/Polychlorinated Biphenyls													
				Aldrin	2.41E+00	mg/kg	2.33E-07	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	3.95E-06	1.81E-06	mg/kg-day	3.00E-05	mg/kg-day	6.03E-02	
				Aroclor 1248	2.59E+02	mg/kg	2.50E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.99E-05	1.94E-04	mg/kg-day	2.00E-05	mg/kg-day	9.71E+00	
				Aroclor 1254	6.20E-01	mg/kg	5.98E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.20E-07	4.65E-07	mg/kg-day	2.00E-05	mg/kg-day	2.33E-02	
				Delta-BHC	3.21E-01	mg/kg	3.10E-08	mg/kg-day	1.80E+00	(mg/kg-day) ⁻¹	5.58E-08	2.41E-07	mg/kg-day	NA	NA	NA	
				Dieldrin	2.57E+00	mg/kg	2.48E-07	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	3.97E-06	1.93E-06	mg/kg-day	5.00E-05	mg/kg-day	3.86E-02	
				Gamma-Chlordane	1.17E+00	mg/kg	1.13E-07	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	3.95E-08	8.78E-07	mg/kg-day	5.00E-04	mg/kg-day	1.76E-03	
				Heptachlor	4.43E+00	mg/kg	4.27E-07	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	1.92E-06	3.32E-06	mg/kg-day	5.00E-04	mg/kg-day	6.65E-03	
				Heptachlor Epoxide	1.14E+00	mg/kg	1.10E-07	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	9.98E-07	8.53E-07	mg/kg-day	1.30E-05	mg/kg-day	6.56E-02	
				Inorganics													
				Arsenic	3.04E+00	mg/kg	1.76E-07	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	2.64E-07	1.37E-06	mg/kg-day	3.00E-04	mg/kg-day	4.56E-03	
				Chromium	7.58E+01	mg/kg	7.31E-06	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	3.66E-06	5.69E-05	mg/kg-day	3.00E-03	mg/kg-day	1.90E-02	
				Manganese	1.41E+03	mg/kg	1.36E-04	mg/kg-day	NA	NA	NA	1.06E-03	mg/kg-day	1.40E-01	mg/kg-day	7.58E-03	
Exp. Route Total											6.52E-05					9.94E+00	
Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatle Organic Compounds	2.80E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA	
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	1.77E-08	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	1.29E-07	1.38E-07	mg/kg-day	NA	NA	NA	
				Benzo(a)pyrene	5.25E-01	mg/kg	2.74E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	2.00E-08	2.13E-07	mg/kg-day	NA	NA	NA	
				Pesticides/Polychlorinated Biphenyls													
				Aldrin	2.41E+00	mg/kg	NA	NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA	
				Aroclor 1248	2.59E+02	mg/kg	1.46E-05	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	2.91E-05	1.13E-04	mg/kg-day	2.00E-05	mg/kg-day	5.66E+00	
				Aroclor 1254	6.20E-01	mg/kg	3.49E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	6.97E-08	2.71E-07	mg/kg-day	2.00E-05	mg/kg-day	1.36E-02	
				Delta-BHC	3.21E-01	mg/kg	NA	NA	1.80E+00	(mg/kg-day) ⁻¹	NA	NA	NA	NA	NA	NA	
				Dieldrin	2.57E+00	mg/kg	NA	NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA	
				Gamma-Chlordane	1.17E+00	mg/kg	NA	NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA	
				Heptachlor	4.43E+00	mg/kg	NA	NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA	
				Heptachlor Epoxide	1.14E+00	mg/kg	NA	NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA	
				Inorganics													
				Arsenic	3.04E+00	mg/kg	3.66E-08	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	5.49E-08	2.85E-07	mg/kg-day	3.00E-04	mg/kg-day	9.50E-04	
				Chromium	7.58E+01	mg/kg	NA	NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA	
				Manganese	1.41E+03	mg/kg	NA	NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA	
Exp. Route Total											2.94E-05					5.68E+00	
Surface Soil	Surface Soil	Surface Soil	Inhalation	Volatle Organic Compounds	2.80E-03	mg/kg	1.50E-05	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	6.13E-11	1.16E-07	mg/m ³	2.00E-03	mg/m ³	5.82E-05	
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	3.20E-09	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	3.52E-12	2.49E-11	mg/m ³	NA	NA	NA	
				Benzo(a)pyrene	5.25E-01	mg/kg	4.97E-09	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	5.46E-13	3.86E-11	mg/m ³	NA	NA	NA	
				Pesticides/Polychlorinated Biphenyls													
				Aldrin	2.41E+00	mg/kg	1.66E-05	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	8.11E-08	1.29E-07	mg/m ³	NA	NA	NA	
				Aroclor 1248	2.59E+02	mg/kg	4.88E-03	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	2.78E-06	3.79E-05	mg/m ³	NA	NA	NA	
				Aroclor 1254	6.20E-01	mg/kg	8.66E-06	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	4.94E-09	6.74E-08	mg/m ³	NA	NA	NA	
				Delta-BHC	3.21E-01	mg/kg	3.04E-09	µg/m ³	5.10E-04	(µg/m ³) ⁻¹	1.55E-12	2.36E-11	mg/m ³	NA	NA	NA	
				Dieldrin	2.57E+00	mg/kg	2.43E-08	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	1.12E-10	1.89E-10	mg/m ³	NA	NA	NA	
				Gamma-Chlordane	1.17E+00	mg/kg	1.11E-08	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	1.11E-12	8.61E-11	mg/m ³	7.00E-04	mg/m ³	1.23E-07	
				Heptachlor	4.43E+00	mg/kg	1.09E-04	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	1.42E-07	8.47E-07	mg/m ³	NA	NA	NA	
				Heptachlor Epoxide	1.14E+00	mg/kg	1.59E-05	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	4.13E-08	1.24E-07	mg/m ³	NA	NA	NA	
				Inorganics													
				Arsenic	3.04E+00	mg/kg	2.87E-08	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	1.24E-10	2.24E-10	mg/m ³	1.50E-05	mg/m ³	1.49E-05	
				Chromium	7.58E+01	mg/kg	7.17E-07	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	8.60E-09	5.58E-09	mg/m ³	1.00E-04	mg/m ³	5.58E-05	
				Manganese	1.41E+03	mg/kg	1.34E-05	µg/m ³	NA	NA	NA	1.04E-07	mg/m ³	5.00E-05	mg/m ³	2.08E-03	
Exp. Route Total											3.06E-06					2.21E-03	
Exposure Point Total											9.76E-05						1.56E+01

NA = not applicable

RID = reference dose

mg/kg = milligram per kilogram

mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter

mg/m³ = milligram per cubic meter

TABLE D-1.4
CALCULATION OF CHEMICAL CANCER RISKS AND NONCANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculation					Noncancer Hazard Calculation						
					Value	Unit	Intake/ Exposure Concentration		Slope Factor/Unit Risk		Cancer Risk	Intake/ Exposure Concentration		RID/RIC		Hazard Quotient		
							Value	Unit	Value	Unit		Value	Unit	Value	Unit			
Surface Soil	Surface Soil	Surface Soil	Ingestion	Volatile Organic Compounds	2.80E-03	mg/kg	5.48E-11	mg/kg-day	4.60E-02	(mg/kg-day) ⁻¹	2.52E-12	4.80E-10	mg/kg-day	5.00E-04	mg/kg-day	9.60E-07		
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	6.63E-09	mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	4.84E-08	5.80E-08	mg/kg-day	NA	NA	NA	NA	
				Benzo(a)pyrene	5.25E-01	mg/kg	1.03E-08	mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	7.51E-09	9.00E-08	mg/kg-day	NA	NA	NA	NA	
				Pesticides/Polychlorinated Biphenyls	2.41E+00	mg/kg	4.72E-08	mg/kg-day	1.70E+01	(mg/kg-day) ⁻¹	8.02E-07	4.13E-07	mg/kg-day	3.00E-05	mg/kg-day	3.00E-05	mg/kg-day	1.38E-02
				Aldrin	2.59E+02	mg/kg	5.07E-06	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.01E-05	4.43E-05	mg/kg-day	2.00E-05	mg/kg-day	2.00E-05	mg/kg-day	2.22E+00
				Aroclor 1248	6.20E-01	mg/kg	1.21E-08	mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	2.43E-08	1.06E-07	mg/kg-day	2.00E-05	mg/kg-day	2.00E-05	mg/kg-day	5.31E-03
				Delta-BHC	3.21E-01	mg/kg	6.29E-09	mg/kg-day	1.80E+00	(mg/kg-day) ⁻¹	1.13E-08	5.50E-08	mg/kg-day	NA	NA	NA	NA	
				Dieldrin	2.57E+00	mg/kg	5.04E-08	mg/kg-day	1.60E+01	(mg/kg-day) ⁻¹	8.06E-07	4.41E-07	mg/kg-day	5.00E-05	mg/kg-day	5.00E-05	mg/kg-day	8.82E-03
				Gamma-Chlordane	1.17E+00	mg/kg	2.29E-08	mg/kg-day	3.50E-01	(mg/kg-day) ⁻¹	8.02E-09	2.01E-07	mg/kg-day	5.00E-04	mg/kg-day	5.00E-04	mg/kg-day	4.01E-04
				Heptachlor	4.43E+00	mg/kg	8.67E-08	mg/kg-day	4.50E+00	(mg/kg-day) ⁻¹	3.90E-07	7.59E-07	mg/kg-day	5.00E-04	mg/kg-day	5.00E-04	mg/kg-day	1.52E-03
				Heptachlor Epoxide	1.14E+00	mg/kg	2.23E-08	mg/kg-day	9.10E+00	(mg/kg-day) ⁻¹	2.02E-07	1.95E-07	mg/kg-day	1.30E-05	mg/kg-day	1.30E-05	mg/kg-day	1.50E-02
				Inorganics	3.04E+00	mg/kg	3.57E-08	mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	5.36E-08	3.12E-07	mg/kg-day	3.00E-04	mg/kg-day	3.00E-04	mg/kg-day	1.04E-03
				Arsenic	7.58E+01	mg/kg	1.48E-06	mg/kg-day	5.00E-01	(mg/kg-day) ⁻¹	7.42E-07	1.30E-05	mg/kg-day	3.00E-03	mg/kg-day	3.00E-03	mg/kg-day	4.33E-03
				Chromium	1.41E+03	mg/kg	2.77E-05	mg/kg-day	NA	NA	NA	2.42E-04	mg/kg-day	1.40E-01	mg/kg-day	1.40E-01	mg/kg-day	1.73E-03
				Manganese	Exp. Route Total													
				1.32E-05														
				Surface Soil	Surface Soil	Surface Soil	Dermal Contact	Volatile Organic Compounds	2.80E-03	mg/kg	NA	NA	4.60E-02	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04
Semi-volatile Organic Compounds	3.39E-01	mg/kg	1.04E-08					mg/kg-day	7.30E+00	(mg/kg-day) ⁻¹	7.59E-08	9.10E-08	mg/kg-day	NA	NA	NA	NA	
Benzo(a)pyrene	5.25E-01	mg/kg	1.61E-08					mg/kg-day	7.30E-01	(mg/kg-day) ⁻¹	1.18E-08	1.41E-07	mg/kg-day	NA	NA	NA	NA	
Pesticides/Polychlorinated Biphenyls	2.41E+00	mg/kg	NA					NA	1.70E+01	(mg/kg-day) ⁻¹	NA	NA	NA	3.00E-05	mg/kg-day	NA	NA	
Aldrin	2.59E+02	mg/kg	8.56E-06					mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	1.71E-05	7.49E-05	mg/kg-day	2.00E-05	mg/kg-day	2.00E-05	mg/kg-day	3.74E+00
Aroclor 1248	6.20E-01	mg/kg	2.05E-08					mg/kg-day	2.00E+00	(mg/kg-day) ⁻¹	4.10E-08	1.79E-07	mg/kg-day	2.00E-05	mg/kg-day	2.00E-05	mg/kg-day	8.97E-03
Delta-BHC	3.21E-01	mg/kg	NA					NA	1.80E+00	(mg/kg-day) ⁻¹	NA	NA	NA	NA	NA	NA	NA	
Dieldrin	2.57E+00	mg/kg	NA					NA	1.60E+01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-05	mg/kg-day	NA	NA	
Gamma-Chlordane	1.17E+00	mg/kg	NA					NA	3.50E-01	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA	NA	
Heptachlor	4.43E+00	mg/kg	NA					NA	4.50E+00	(mg/kg-day) ⁻¹	NA	NA	NA	5.00E-04	mg/kg-day	NA	NA	
Heptachlor Epoxide	1.14E+00	mg/kg	NA					NA	9.10E+00	(mg/kg-day) ⁻¹	NA	NA	NA	1.30E-05	mg/kg-day	NA	NA	
Inorganics	3.04E+00	mg/kg	2.15E-08					mg/kg-day	1.50E+00	(mg/kg-day) ⁻¹	3.23E-08	1.88E-07	mg/kg-day	3.00E-04	mg/kg-day	3.00E-04	mg/kg-day	6.28E-04
Arsenic	7.58E+01	mg/kg	NA					NA	5.00E-01	(mg/kg-day) ⁻¹	NA	NA	NA	7.50E-05	mg/kg-day	NA	NA	
Chromium	1.41E+03	mg/kg	NA					NA	NA	NA	NA	NA	NA	5.60E-03	mg/kg-day	NA	NA	
Manganese	Exp. Route Total																	
1.73E-05																		
Surface Soil	Surface Soil	Surface Soil	Inhalation					Volatile Organic Compounds	2.80E-03	mg/kg	7.59E-07	µg/m ³	4.10E-06	(µg/m ³) ⁻¹	3.11E-12	1.16E-06	mg/m ³	2.00E-03
				Semi-volatile Organic Compounds	3.39E-01	mg/kg	1.63E-10	µg/m ³	1.10E-03	(µg/m ³) ⁻¹	1.79E-13	2.49E-10	mg/m ³	NA	NA	NA	NA	
				Benzo(a)pyrene	5.25E-01	mg/kg	2.52E-10	µg/m ³	1.10E-04	(µg/m ³) ⁻¹	2.77E-14	3.86E-10	mg/m ³	NA	NA	NA	NA	
				Pesticides/Polychlorinated Biphenyls	2.41E+00	mg/kg	8.40E-07	µg/m ³	4.90E-03	(µg/m ³) ⁻¹	4.12E-09	1.29E-06	mg/m ³	NA	NA	NA	NA	
				Aldrin	2.59E+02	mg/kg	2.47E-04	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	1.41E-07	3.79E-04	mg/m ³	NA	NA	NA	NA	
				Aroclor 1248	6.20E-01	mg/kg	4.40E-07	µg/m ³	5.70E-04	(µg/m ³) ⁻¹	2.51E-10	6.74E-07	mg/m ³	NA	NA	NA	NA	
				Delta-BHC	3.21E-01	mg/kg	1.54E-10	µg/m ³	5.10E-04	(µg/m ³) ⁻¹	7.86E-14	2.36E-10	mg/m ³	NA	NA	NA	NA	
				Dieldrin	2.57E+00	mg/kg	1.23E-09	µg/m ³	4.60E-03	(µg/m ³) ⁻¹	5.68E-12	1.89E-09	mg/m ³	NA	NA	NA	NA	
				Gamma-Chlordane	1.17E+00	mg/kg	5.62E-10	µg/m ³	1.00E-04	(µg/m ³) ⁻¹	5.62E-14	8.61E-10	mg/m ³	2.00E-04	mg/m ³	2.00E-04	mg/m ³	4.31E-06
				Heptachlor	4.43E+00	mg/kg	5.52E-06	µg/m ³	1.30E-03	(µg/m ³) ⁻¹	7.18E-09	8.47E-06	mg/m ³	NA	NA	NA	NA	
				Heptachlor Epoxide	1.14E+00	mg/kg	8.07E-07	µg/m ³	2.60E-03	(µg/m ³) ⁻¹	2.10E-09	1.24E-06	mg/m ³	NA	NA	NA	NA	
				Inorganics	3.04E+00	mg/kg	1.46E-09	µg/m ³	4.30E-03	(µg/m ³) ⁻¹	6.27E-12	2.24E-09	mg/m ³	2.00E-04	mg/m ³	2.00E-04	mg/m ³	1.12E-05
				Arsenic	7.58E+01	mg/kg	3.64E-08	µg/m ³	1.20E-02	(µg/m ³) ⁻¹	4.36E-10	5.58E-08	mg/m ³	3.00E-04	mg/m ³	3.00E-04	mg/m ³	1.86E-04
				Chromium	1.41E+03	mg/kg	6.78E-07	µg/m ³	NA	NA	NA	1.04E-06	mg/m ³	1.70E-04	mg/m ³	1.70E-04	mg/m ³	6.12E-03
				Manganese	Exp. Route Total													
				1.55E-07														
				Exposure Point Total														
3.07E-05																		

NA = not applicable

RID = reference dose

mg/kg = milligram per kilogram
 mg/kg-day = milligram per kilogram per day

µg/m³ = microgram per cubic meter
 mg/m³ = milligram per cubic meter

TABLE D-2.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient							
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total			
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds												
			Trichloroethene	1E-11	NA	5E-11	6E-11	Heart/ Immune System/ Developmental/Kidney/Liver	3.26E-06	NA	4.51E-05	4.84E-05			
			Semi-volatile Organic Compounds												
			Benzo(a)pyrene	3E-07	2E-07	5E-12	5E-07	NA	NA	NA	NA	NA			
			Benzo(b)fluoranthene	5E-08	3E-08	8E-13	8E-08	NA	NA	NA	NA	NA			
			Pesticides/Polychlorinated Biphenyls												
			Aldrin	5E-06	NA	1E-07	5E-06	Liver	7.22E-02	NA	NA	7.22E-02			
			Aroclor 1248	8E-05	4E-05	4E-06	1E-04	Eyes/Fingers/Toe	1.46E+01	8.51E+00	NA	2.31E+01			
			Aroclor 1254	1E-07	9E-08	6E-09	2E-07	Nails/Immune System	2.88E-02	1.68E-02	NA	4.55E-02			
								Eyes/Fingers/Toe							
								Nails/Immune System							
			Dieldrin	6E-06	NA	2E-10	6E-06	Liver	5.59E-02	NA	NA	5.59E-02			
			Gamma-Chlordane	6E-08	NA	2E-12	6E-08	Liver	2.60E-03	NA	1.82E-07	2.60E-03			
			Heptachlor	3E-06	NA	2E-07	3E-06	Liver	1.06E-02	NA	NA	1.06E-02			
			Heptachlor Epoxide	2E-06	NA	8E-08	2E-06	Liver	1.33E-01	NA	NA	1.33E-01			
			Inorganics												
			Arsenic	4E-07	8E-08	2E-10	5E-07	Developmental/Cardiovascular System/Nervous System/Lung/Skin	6.64E-03	1.38E-03	2.17E-05	8.04E-03			
Chromium	5E-06	NA	1E-08	5E-06	Lung	2.64E-02	NA	7.77E-05	2.65E-02						
Manganese	NA	NA	NA	NA	CNS	1.69E-02	NA	4.64E-03	2.15E-02						
Chemical Total	1E-04	4E-05	5E-06	1E-04	Chemical Total	1.49E+01	8.52E+00	4.79E-03	2.35E+01						
		Exposure Point Total								2.35E+01					
		Exposure Medium Total								2.35E+01					
Medium Total										2.35E+01					
Receptor Total										2.35E+01					

Total Excess Cancer Risk Across All Media = 1E-04

Total Hazard Index Across All Media = 23

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	0.02
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	23
Fingers HI Across All Media =	23
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	23
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.3
Lung HI Across All Media =	0.03
Nervous System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	23

NA = not applicable

CNS = central nervous system

TABLE D-2.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient								
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total				
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds													
			Trichloroethene	2E-12	NA	2E-12	4E-12	Heart/ Immune System/ Developmental/Kidney	7.45E-07	NA	4.51E-04	4.52E-04				
			Semi-volatile Organic Compounds													
			Benzo(a)pyrene	7E-08	1E-07	3E-13	2E-07	NA	NA	NA	NA	NA				
			Benzo(b)fluoranthene	1E-08	2E-08	4E-14	3E-08	NA	NA	NA	NA	NA				
			Pesticides/Polychlorinated Biphenyls													
			Aldrin	1E-06	NA	5E-09	1E-06	Liver	1.65E-02	NA	NA	1.65E-02				
			Aroclor 1248	2E-05	3E-05	2E-07	4E-05	Eyes/Fingers/Toe Nails/Immune System	3.33E+00	5.63E+00	NA	8.96E+00				
			Aroclor 1254	3E-08	5E-08	3E-10	8E-08	Eyes/Fingers/Toe Nails/Immune System	6.57E-03	1.11E-02	NA	1.77E-02				
			Dieldrin	1E-06	NA	8E-12	1E-06	Liver	1.28E-02	NA	NA	1.28E-02				
			Gamma-Chlordane	1E-08	NA	8E-14	1E-08	Liver	5.92E-04	NA	6.36E-06	5.99E-04				
			Heptachlor	6E-07	NA	1E-08	6E-07	Liver	2.42E-03	NA	NA	2.42E-03				
			Heptachlor Epoxide	4E-07	NA	4E-09	4E-07	Liver	3.03E-02	NA	NA	3.03E-02				
			Inorganics													
			Arsenic	8E-08	5E-08	9E-12	1E-07	Skin/Developmental/Cardiovascular System/Nervous System	1.52E-03	9.14E-04	1.63E-05	2.45E-03				
			Chromium	1E-06	NA	6E-10	1E-06	Respiratory System	6.03E-03	NA	2.59E-04	6.29E-03				
			Manganese	NA	NA	NA	NA	CNS/Nervous System	3.86E-03	NA	1.37E-02	1.75E-02				
Chemical Total	2E-05	3E-05	2E-07	5E-05	Chemical Total	3.41E+00	5.64E+00	1.44E-02	9.06E+00							
		Exposure Point Total							5E-05	9.06E+00						
		Exposure Medium Total							5E-05	9.06E+00						
Medium Total									5E-05	9.06E+00						
Receptor Total									5E-05	9.06E+00						

Total Excess Cancer Risk Across All Media **5E-05**

Total Hazard Index Across All Media **9**

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	0.02
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	9
Fingers HI Across All Media =	9
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	9
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.06
Nervous System HI Across All Media =	0.02
Respiratory System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	9

NA = not applicable

CNS = central nervous system

TABLE D-2.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds									
			Trichloroethene	1E-11	NA	6E-11	7E-11	Heart/ Immune System/ Developmental/Kidney/Liver	4.20E-06	NA	5.82E-05	6.24E-05
			Semi-volatile Organic Compounds									
			Benzo(a)pyrene	2E-07	1E-07	4E-12	4E-07	NA	NA	NA	NA	NA
			Benzo(b)fluoranthene	4E-08	2E-08	5E-13	6E-08	NA	NA	NA	NA	NA
			Pesticides/Polychlorinated Biphenyls									
			Aldrin	4E-06	NA	8E-08	4E-06	Liver	6.03E-02	NA	NA	6.03E-02
			Aroclor 1248	5E-05	3E-05	3E-06	8E-05	Eyes/Fingers/Toe Nails/Immune System	9.71E+00	5.66E+00	NA	1.54E+01
			Aroclor 1254	1E-07	7E-08	5E-09	2E-07	Eyes/Fingers/Toe Nails/Immune System	2.33E-02	1.36E-02	NA	3.68E-02
			Delta-BHC	6E-08	NA	2E-12	6E-08	NA	NA	NA	NA	NA
			Dieldrin	4E-06	NA	1E-10	4E-06	Liver	3.86E-02	NA	NA	3.86E-02
			Gamma-Chlordane	4E-08	NA	1E-12	4E-08	Liver	1.76E-03	NA	1.23E-07	1.76E-03
			Heptachlor	2E-06	NA	1E-07	2E-06	Liver	6.65E-03	NA	NA	6.65E-03
			Heptachlor Epoxide	1E-06	NA	4E-08	1E-06	Liver	6.56E-02	NA	NA	6.56E-02
			Inorganics									
			Arsenic	3E-07	5E-08	1E-10	3E-07	Developmental/Cardiovascular System/Nervous System/Lung/Skin	4.56E-03	9.50E-04	1.49E-05	5.53E-03
			Chromium	4E-06	NA	9E-09	4E-06	Lung	1.90E-02	NA	5.58E-05	1.90E-02
Manganese	NA	NA	NA	NA	CNS	7.58E-03	NA	2.08E-03	9.65E-03			
Chemical Total	7E-05	3E-05	3E-06	1E-04	Chemical Total	9.94E+00	5.68E+00	2.21E-03	1.56E+01			
		Exposure Point Total							1.56E+01			
		Exposure Medium Total							1.56E+01			
Medium Total									1.56E+01			
Receptor Total									1.56E+01			

Total Excess Cancer Risk Across All Media = 1E-04

Total Hazard Index Across All Media = 16

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	<0.01
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	15
Fingers HI Across All Media =	15
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	15
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.2
Lung HI Across All Media =	0.02
Nervous System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	15

NA = not applicable

CNS = central nervous system

GI = gastrointestinal

TABLE D-2.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
CENTRAL TENDENCY EXPOSURE

Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient												
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total								
Surface Soil	Surface Soil	Surface Soil	Volatile Organic Compounds																	
			Trichloroethene	3E-12	NA	3E-12	6E-12	Heart/ Immune System/ Developmental/Kidney	9.60E-07	NA	5.82E-04	5.82E-04								
			Semi-volatile Organic Compounds																	
			Benzo(a)pyrene	5E-08	8E-08	2E-13	1E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
			Benzo(b)fluoranthene	8E-09	1E-08	3E-14	2E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
			Pesticides/Polychlorinated Biphenyls																	
			Aldrin	8E-07	NA	4E-09	8E-07	Liver	1.38E-02	NA	NA	1.38E-02								
			Aroclor 1248	1E-05	2E-05	1E-07	3E-05	Eyes/Fingers/Toe	2.22E+00	3.74E+00	NA	5.96E+00								
			Aroclor 1254	2E-08	4E-08	3E-10	7E-08	Nails/Immune System	5.31E-03	8.97E-03	NA	1.43E-02								
			Delta-BHC	1E-08	NA	8E-14	1E-08	Eyes/Fingers/Toe	NA	NA	NA	NA								
			Dieldrin	8E-07	NA	6E-12	8E-07	Nails/Immune System	NA	NA	NA	NA								
			Gamma-Chlordane	8E-09	NA	6E-14	8E-09	Liver	8.82E-03	NA	NA	8.82E-03								
			Heptachlor	4E-07	NA	7E-09	4E-07	Liver	4.01E-04	NA	4.31E-06	4.05E-04								
			Heptachlor Epoxide	2E-07	NA	2E-09	2E-07	Liver	1.52E-03	NA	NA	1.52E-03								
			Inorganics																	
			Arsenic	5E-08	3E-08	6E-12	9E-08	Liver	1.50E-02	NA	NA	1.50E-02								
			Chromium	7E-07	NA	4E-10	7E-07	Skin/Developmental/Cardiovascular System/Nervous System	1.04E-03	6.28E-04	1.12E-05	1.68E-03								
Manganese	NA	NA	NA	NA	Respiratory System	4.33E-03	NA	1.86E-04	4.51E-03											
Chemical Total	1E-05	2E-05	2E-07	3E-05	CNS/Nervous System	1.73E-03	NA	6.12E-03	7.85E-03											
		Exposure Point Total																		
		Exposure Medium Total																		
Medium Total																				
Receptor Total																				

Total Excess Cancer Risk Across All Media = 3E-05

Total Hazard Index Across All Media = 6

Cardiovascular System HI Across All Media =	<0.01
CNS HI Across All Media =	<0.01
Development HI Across All Media =	<0.01
Eyes HI Across All Media =	6
Fingers HI Across All Media =	6
Heart HI Across All Media =	<0.01
Immune system HI Across All Media =	6
Kidney HI Across All Media =	<0.01
Liver HI Across All Media =	0.04
Nervous System HI Across All Media =	<0.01
Respiratory System HI Across All Media =	<0.01
Skin HI Across All Media =	<0.01
Toe Nails HI Across All Media =	6

NA = not applicable

CNS = central nervous system

GI = gastrointestinal

TABLE D-3.1
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient									
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total					
Surface Soil	Surface Soil	Surface Soil	Pesticides/Polychlorinated Biphenyls					Liver Eyes/Fingers/Toe Nails/Immune System Liver Liver Liver Liver	7.22E-02 1.46E+01 5.59E-02 1.06E-02 1.33E-01	NA 8.51E+00 NA NA NA NA	NA NA NA NA	7.22E-02 2.31E+01 5.59E-02 1.06E-02 1.33E-01					
			Aldrin	5E-06	NA	1E-07	5E-06										
			Aroclor 1248	8E-05	4E-05	4E-06	1E-04										
			Dieldrin	6E-06	NA	2E-10	6E-06										
			Heptachlor	3E-06	NA	2E-07	3E-06										
			Heptachlor Epoxide	2E-06	NA	8E-08	2E-06										
			Inorganics														
			Chromium	5E-06	NA	1E-08	5E-06						Lung	2.64E-02	NA	7.77E-05	2.65E-02
			Chemical Total	1E-04	4E-05	5E-06	1E-04						Chemical Total	1.49E+01	8.52E+00	4.79E-03	2.35E+01
			Exposure Point Total				1E-04						2.35E+01				
Exposure Medium Total				1E-04				2.35E+01									
Medium Total				1E-04				2.35E+01									
Receptor Total				1E-04				2.35E+01									

Total Excess Cancer Risk Across All Media 1E-04

Total Hazard Index Across All Media 23

Eyes HI Across All Media = 23
 Fingers HI Across All Media = 23
 Immune system HI Across All Media = 23
 Toe Nails HI Across All Media = 23

Note:
 Only chemicals above EPA's threshold values are listed in this table

TABLE D-3.2
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface Soil	Surface Soil	Surface Soil	Pesticides/Polychlorinated Biphenyls										
			Aroclor 1248	2E-05	3E-05	2E-07	4E-05	Eyes/Fingers/Toe Nails/Immune System	3.33E+00	5.63E+00	NA	8.96E+00	
			Dieldrin	1E-06	NA	8E-12	1E-06	Liver	1.28E-02	NA	NA	1.28E-02	
			Inorganics										
			Chromium	1E-06	NA	6E-10	1E-06	Respiratory System	6.03E-03	NA	2.59E-04	6.29E-03	
			Chemical Total	2E-05	3E-05	2E-07	5E-05	Chemical Total	3.41E+00	5.64E+00	1.44E-02	9.06E+00	
			Exposure Point Total				5E-05					9.06E+00	
			Exposure Medium Total				5E-05					9.06E+00	
Medium Total							5E-05					9.06E+00	
Receptor Total							5E-05					9.06E+00	

Total Excess Cancer Risk Across All Media = 5E-05

Total Hazard Index Across All Media = 9

Eyes HI Across All Media = 9

Fingers HI Across All Media = 9

Immune system HI Across All Media = 9

Toe Nails HI Across All Media = 9

Note:
 Only chemicals above EPA's threshold values are listed in this table

TABLE D-3.3
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient					
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	
Surface Soil	Surface Soil	Surface Soil	Pesticides/Polychlorinated Biphenyls										
			Aldrin	4E-06	NA	8E-08	4E-06	Liver	6.03E-02	NA	NA	6.03E-02	
			Aroclor 1248	5E-05	3E-05	3E-06	8E-05	Eyes/Fingers/Toe Nails/Immune System	9.71E+00	5.66E+00	NA	1.54E+01	
			Dieldrin	4E-06	NA	1E-10	4E-06	Liver	3.86E-02	NA	NA	3.86E-02	
			Heptachlor	2E-06	NA	1E-07	2E-06	Liver	6.65E-03	NA	NA	6.65E-03	
			Heptachlor Epoxide	1E-06	NA	4E-08	1E-06	Liver	6.56E-02	NA	NA	6.56E-02	
			Inorganics										
			Chromium	4E-06	NA	9E-09	4E-06	Lung	1.90E-02	NA	5.58E-05	1.90E-02	
			Chemical Total	7E-05	3E-05	3E-06	1E-04	Chemical Total	9.94E+00	5.68E+00	2.21E-03	1.56E+01	
			Exposure Point Total								1.56E+01		
Exposure Medium Total								1E-04					
Medium Total								1E-04					
Receptor Total								1.56E+01					

Total Excess Cancer Risk Across All Media 1E-04

Total Hazard Index Across All Media 16

Eyes HI Across All Media = 15
 Fingers HI Across All Media = 15
 Immune system HI Across All Media = 15
 Toe Nails HI Across All Media = 15

NA = not applicable CNS = central nervous system
 Note:
 Only chemicals above EPA's threshold values are listed in this table

TABLE D-3.4
RISK ASSESSMENT SUMMARY
CENTRAL TENDENCY EXPOSURE
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

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

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient				
				Ingestion	Dermal Contact	Inhalation	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Dermal Contact	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Pesticides/Polychlorinated Biphenyls	1E-05	2E-05	1E-07	3E-05	Eyes/Fingers/Toe Nails/Immune System	2.22E+00	3.74E+00	NA	5.96E+00
			Aroclor 1248									
			Inorganics									
			Chemical Total									
			Exposure Point Total				3E-05					6.03E+00
			Exposure Medium Total				3E-05					6.03E+00
Medium Total							3E-05					6.03E+00
Receptor Total							3E-05					6.03E+00

Total Excess Cancer Risk Across All Media 3E-05

Total Hazard Index Across All Media 6

Eyes HI Across All Media = 6
 Fingers HI Across All Media = 6
 Immune system HI Across All Media = 6
 Toe Nails HI Across All Media = 6

NA = not applicable

Note:

Only chemicals above EPA's threshold values are listed in this table

Appendix E

Indoor Air Screening

Table E-1 PCB Summary Table for Indoor Air Results Screening

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TABLE E-1
PCB SUMMARY TABLE FOR INDOOR AIR RESULTS SCREENING
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

RST 2 Sample ID	Screening Criteria ⁽¹⁾	P001- AA001- 001	P001- AA002- 001	P001- AA003- 001	P001- AA004- 001	P001- AA005- 001	P001- AA006- 001	P001- AA007- 001
Sample Date		10/18/12	10/18/12	10/18/12	10/18/12	10/18/12	10/18/12	10/18/12
Sample Time		17:02	16:54	16:35	16:08	16:20	16:47	17:00
PCB								
Aroclor - 1016	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U
Aroclor - 1221	0.022	0.1 U	0.097 U	0.1 U	0.098 U	0.097 U	0.096 U	0.1 U
Aroclor - 1232	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U
Aroclor - 1242	0.022	3.2	9.2	3.5	1.9	2.4	11	20
Aroclor - 1248	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U
Aroclor - 1254	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U
Aroclor - 1260	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U
Aroclor - 1262	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U
Aroclor - 1268	0.022	0.05 U	0.049 U	0.05 U	0.049 U	0.049 U	0.048 U	0.05 U

Notes:

Unit presented in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

Bold value indicates detected result above screening criteria

U = not detected

⁽¹⁾Screening criteria based on vapor intrusion screening level for commercial scenario (target cancer risk of 10^{-6} and noncancer hazard quotient of 1)

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Appendix F

Evaluation of PCB Congeners and Dioxins/Furans Results

CDM Federal Programs Corporation (CDM Smith) performed the remedial investigation (RI) field investigation between June 8, 2015 and July 29, 2015. During the RI, United States Environmental Protection Agency (EPA) selected 10 soil samples to be analyzed for total polychlorinated biphenyl (PCB) congeners. These samples were from depth intervals collected between 0 and 6 feet below ground surface (bgs). In addition, 15 soil samples were analyzed for dioxins/furans. Only 10 samples were collected from 0 to 10 feet bgs and only these samples were evaluated in this appendix.

The concentration of total PCB congeners is sum of total detected concentrations of individual PCB congeners (Table F-1). As discussed in the RI report, concentrations of total Aroclors and total PCB congeners were detected at concentrations above 1,000 µg/kg (CDM Smith 2016). There is no consistent relationship that can be drawn between the concentrations detected for total Aroclors vs. total PCB congeners. However, in every case where concentrations exceeded 1,000 µg/kg for total Aroclors, the corresponding total PCB congener result also exceeded 1,000 µg/kg. Of the 10 total PCB congener samples, 80 percent exceeded 1,000 µg/kg.

Dioxins/furans are structurally and toxicologically related halogenated aromatic hydrocarbons. Dioxins and furans exhibit similar toxicological properties; however, they differ in the degree of toxicity. The toxicity equivalence factor (TEF) methodology, a component mixture method, is used to evaluate human health risks posed by these mixtures, using 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) as the index chemical (EPA 2010). TEF values for TCDD and dioxins/furans published by the World Health Organization in 2005 are used (Van den Berg et al. 2006).

Toxicity equivalences (TEQs) for 2,3,7,8-TCDD are calculated by summing the products of concentrations and congener-specific TEFs for individual congeners. Because dioxin/furan datasets contain at least 10 percent of congener concentrations below the reporting limit and non-detected data are reported with multiple reporting limits, the Kaplan-Meier (K-M) statistical method is implemented to more rigorously address estimated parameters such as mean concentrations. The K-M method is a nonparametric statistical method that does not rely on assumptions about data distributions and does not use parameters such as mean or standard deviation. Instead of assuming a fraction of the reporting limit, the K-M method considers only the relative order (or rank) of the data. This approach is particularly appropriate for dioxin/furan datasets with many non-detects and multiple reporting limits that were reported for the 17 congeners (Michelsen 2008 and Helsel 2010). ProUCL version 5.0.00 (EPA 2013) is used to implement the K-M method and to estimate average dioxin/furan TEQ concentrations. Total 2,3,7,8-TCDD TEQs are then estimated by multiplying the average TEQ by the number of congeners.

Total TCDD TEQ ranges from 0.4097 to 88.451 nanogram per kilogram (ng/kg) (Table F-2). The maximum concentration of total TCDD TEQ (88.451 ng/kg) exceeded 22 ng/kg, the EPA Regional Screening Level (RSL) based on target risk range of 10^{-6} and hazard index (HI) of 0.1 for industrial soil (EPA 2015). This suggests that unacceptable health risks are likely to occur from the exposures to dioxins/furans in soil. However, all total TCDD TEQ concentrations did not exceed the NJDEP proposed soil remediation standard for 2,3,7,8-TCDD of 700 ng/kg. In addition, detections of dioxins and furans correlate spatially with the distribution of PCBs that will be remediated.

References:

- CDM Smith. 2016. Final Remedial Investigation Report, Unimatic Manufacturing Corporation Superfund Site, Fairfield, New Jersey. July.
- United States Environmental Protection Agency (EPA). 2010c. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. EPA/100/R-10/005. December.
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- Michelsen, T. 2008. Statistics Workshop Record, Statistical Expert's Workshop. Sponsored by Regional Sediment Evaluation Team, DMMP Dioxin Workgroup, EPA Region 10 Superfund.
- Van den Berg, M. *et al.* 2006. The 2005 World Health Organization re-evaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. Toxicological Science, 93(2):223-241.

TABLE F-1
ANALYTICAL RESULTS FOR POLYCHLORINATED BIPHENYLS CONGENERS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

CAS No.	Chemical	Location Sample ID Date Depth Unit	B-13	B-13	C-11	C-11	D-13B	D-13B	E-15	E-15	F-8	F-8
			SB-B-13-A 7/8/2015 0 to 2 feet	SB-B-13-B 7/8/2015 2 to 4.3 feet	SB-C-11-A 6/15/2015 0 to 2 feet	SB-C-11-B 6/15/2015 2 to 6 feet	SB-D-13B-A 7/7/2015 0 to 2 feet	SB-D-13B-B 7/7/2015 2 to 6 feet	SB-E-15-A 7/7/2015 0 to 2 feet	SB-E-15-B 7/7/2015 2 to 6 feet	SB-F-8-A 6/18/2015 0 to 2 feet	SB-F-8-B 6/18/2015 2 to 6 feet
2051-60-7	PCB-1	ng/kg	223 U	21.7 U	2030 U	1050 U	43000	269000	499 U	23.9 U	1080 U	9140
2051-61-8	PCB-2	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
2051-62-9	PCB-3	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2620	499 U	23.9 U	1080 U	2100 U
13029-08-8	PCB-4	ng/kg	223 U	42.2	9720	2910	1990000	4800000	2590	262	6690	706000
16605-91-7	PCB-5	ng/kg	223 U	21.7 U	2030 U	1050 U	5560	18000	499 U	23.9 U	1080 U	6490
25569-80-6	PCB-6	ng/kg	223 U	21.7 U	4310	1760	118000	281000	499 U	23.9 U	1080 U	79200
33284-50-3	PCB-7	ng/kg	223 U	21.7 U	2030 U	1050 U	17000	104000	499 U	23.9 U	1080 U	7450
34883-43-7	PCB-8	ng/kg	223 U	34.4 U	10900 U	6560 U	911000	3160000	873 U	82.9 U	3420 U	429000
34883-39-1	PCB-9	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	26600	499 U	23.9 U	1080 U	12700
33146-45-1	PCB-10	ng/kg	223 U	21.7 U	10900	1050	263000	503000	499 U	23.9 U	1080 U	56200
2050-67-1	PCB-11	ng/kg	223 U	27.3 U	2580 U	1050 U	69000	108000	499 U	23.9 U	1080 U	2100 U
2974-92	PCB-12/13	ng/kg	445 U	43.4 U	11800	2110 U	20700	61200	998 U	47.9 U	2160 U	11800
34883-41-5	PCB-14	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
2050-68-2	PCB-15	ng/kg	2760 U	520	386000	43900	177000	773000	4630 U	95.6 U	21200	265000
38444-78-9	PCB-16	ng/kg	290 U	58 U	213000	96900	452000	361000	620 U	23.9 U	14200 U	591000
37680-66-3	PCB-17	ng/kg	526 U	92.5 U	332000	54500	3720000	4150000	2600 U	117 U	37000	1020000
PCB-18/30	PCB-18/30	ng/kg	1070 U	174 U	156000 U	108000	691000	418000	3910 U	47.9 U	37600 U	1330000
38444-73-4	PCB-19	ng/kg	223 U	27.8	431000	19800	2820000	3850000	1190	110	32700	451000
PCB-20/28	PCB-20/28	ng/kg	28500	4930	3850000	380000	3370000	6920000	58400	375 U	409000	2980000
PCB-21/33	PCB-21/33	ng/kg	1480 U	230 U	229000	82200	645000	802000	3790 U	49.1 U	30800 U	816000
38444-85-8	PCB-22	ng/kg	4020 U	729 U	1050000	147000	1180000	659000	17300 U	97.2 U	116000	971000
55720-44-0	PCB-23	ng/kg	223 U	21.7 U	2030 U	1050 U	3900	6290	499 U	23.9 U	1080 U	2640
55702-45-9	PCB-24	ng/kg	223 U	21.7 U	19400	1050 U	2180 U	2100 U	499 U	23.9 U	2880	2100 U
55712-37-3	PCB-25	ng/kg	481	73.2	112000	17200	176000	226000	1560	23.9 U	12400	138000
PCB-26/29	PCB-26/29	ng/kg	1300	215	256000	43100	160000	170000	3830	47.9 U	25700	276000
38444-76-7	PCB-27	ng/kg	223 U	33.1 U	220000	16800	1310000	1920000	1370 U	54.3 U	15800	238000
16606-02-3	PCB-31	ng/kg	15700 U	2700	1280000	270000	901000	1260000	32700 U	492 U	106000	1830000
38444-77-8	PCB-32	ng/kg	585 U	112 U	975000	88400	3390000	3500000	3830 U	104 U	83400	892000
37680-68-5	PCB-34	ng/kg	223 U	21.7 U	7490	1050 U	17800	30200	499 U	23.9 U	1080 U	12300
37680-69-6	PCB-35	ng/kg	302	59.5	16500	2670	11700	24000	499 U	23.9 U	1690	12700
38444-87-0	PCB-36	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
38444-90-5	PCB-37	ng/kg	15100	2720	971000	100000	671000	958000	31100	400 U	114000	596000
53555-66-1	PCB-38	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
38444-88-1	PCB-39	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
PCB-40/71	PCB-40/71	ng/kg	13300 U	2060 U	2120000	220000	5440000	3030000	44300 U	165 U	272000	1930000
52663-59-9	PCB-41	ng/kg	812 U	264 U	249000	39700	750000	202000	6520 U	23.9 U	41000	295000
36559-22-5	PCB-42	ng/kg	8280 U	1240	1210000	127000	2570000	705000	24600 U	96.5 U	160000	1110000
70362-46-8	PCB-43	ng/kg	2650	306	225000	25200	666000	395000	6240 U	25.1 U	32200	271000
PCB-44/47/65	PCB-44/47/65	ng/kg	41500	6720	3870000	428000	9400000	4450000	118000	405 U	576000	3740000
PCB-45/51	PCB-45/51	ng/kg	2420 U	402 U	833000	96000	1870000	945000	12400 U	57.9 U	111000	778000
41464-47-5	PCB-46	ng/kg	403 U	61.6 U	297000	34200	579000	190000	2160 U	23.9 U	29300	274000
70362-47-9	PCB-48	ng/kg	6230	965	489000	65800	1870000	1130000	18900	65.5 U	91700	875000
PCB-49/69	PCB-49/69	ng/kg	43700	7400	2300000	234000	5070000	1480000	106000	482 U	350000	2120000
PCB-50/53	PCB-50/53	ng/kg	2540 U	408	596000	67400	1600000	819000	9240 U	47.9 U	80000	611000
35693-99-3	PCB-52	ng/kg	69400	11800	3120000	382000	3510000	1830000	159000	610 U	541000	3300000
15968-05-5	PCB-54	ng/kg	223 U	21.7 U	12900	1050 U	67100	95900	499 U	23.9 U	1210	11700
74338-24-2	PCB-55	ng/kg	3700	597	125000	14000	261000	137000	499 U	40.7 U	16300	60400
41464-43-1	PCB-56	ng/kg	54000	9370	2120000	221000	4080000	1450000	120000	831 U	328000	1520000
70424-67-8	PCB-57	ng/kg	223 U	35.4	15300	1610	39700	29700	645	23.9 U	2540	11500
41464-49-7	PCB-58	ng/kg	330	33.2	7900	1050 U	12700	7170	499 U	23.9 U	1420	5080

TABLE F-1
ANALYTICAL RESULTS FOR POLYCHLORINATED BIPHENYLS CONGENERS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

CAS No.	Chemical	Location Sample ID Date Depth Unit	B-13	B-13	C-11	C-11	D-13B	D-13B	E-15	E-15	F-8	F-8
			SB-B-13-A 7/8/2015 0 to 2 feet	SB-B-13-B 7/8/2015 2 to 4.3 feet	SB-C-11-A 6/15/2015 0 to 2 feet	SB-C-11-B 6/15/2015 2 to 6 feet	SB-D-13B-A 7/7/2015 0 to 2 feet	SB-D-13B-B 7/7/2015 2 to 6 feet	SB-E-15-A 7/7/2015 0 to 2 feet	SB-E-15-B 7/7/2015 2 to 6 feet	SB-F-8-A 6/18/2015 0 to 2 feet	SB-F-8-B 6/18/2015 2 to 6 feet
PCB-59/62/75	PCB-59/62/75	ng/kg	4570	740	363000	36800	815000	361000	12500	71.8 U	55500	325000
33025-41-1	PCB-60	ng/kg	34100	5970	1330000	138000	3090000	1210000	89500	811 U	220000	929000
PCB-61/70/74/76	PCB-61/70/74/76	ng/kg	176000	30600	6210000	585000	8550000	6400000	338000	3260 U	776000	4260000
74472-34-7	PCB-63	ng/kg	3330	575	164000	15000	399000	330000	8490	104 U	26400	118000
52663-58-8	PCB-64	ng/kg	39500	6790	2090000	216000	2150000	1240000	99300	580 U	340000	1790000
32598-10-0	PCB-66	ng/kg	141000	25400	3970000	358000	4720000	3100000	298000	2360 U	600000	2580000
73575-53-8	PCB-67	ng/kg	1510	228	92000	9530	206000	129000	3360	24.1	15100	71300
73575-52-7	PCB-68	ng/kg	223 U	33	9180	1050 U	17700	24500	552	23.9 U	1090	4420
41464-42-0	PCB-72	ng/kg	512	99.5	18100	1410	37500	35800	1220	23.9 U	2350	11600
74338-23-1	PCB-73	ng/kg	1870	294	79500	8370	170000	63100	3980	23.9 U	10400	81300
32598-13-3	PCB-77	ng/kg	16000	2920	397000	38700	877000	745000	34700	345 U	60000	217000
70362-49-1	PCB-78	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
41464-48-6	PCB-79	ng/kg	719	131	21600	2150	37500	18100	499 U	23.9 U	3120	7920
33284-52-5	PCB-80	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
70362-50-4	PCB-81	ng/kg	682	108	18500	1710	46300	29500	1440	23.9 U	2900	10200
52663-62-4	PCB-82	ng/kg	9690	1710	405000	41800	788000	302000	20400	112 U	57900	226000
60145-20-2	PCB-83	ng/kg	2600	675	101000	8890	164000	75100	8050	41.7 U	14800	61300
52663-60-2	PCB-84	ng/kg	10800	1830	633000	63800	1140000	372000	26600	105 U	90300	402000
PCB-85/116/117	PCB-85/116/117	ng/kg	22000	4170	509000	47600	1060000	522000	49700	406 U	76500	281000
PCB-CE02	PCB-86/87/97/109/119/125	ng/kg	50200	8780	1480000	142000	2910000	1330000	105000	630 U	221000	843000
PCB-88/91	PCB-88/91	ng/kg	10300	1850	387000	36100	741000	318000	23400	129 U	57200	233000
73575-57-2	PCB-89	ng/kg	837	139	73700	7430	145000	59100	2620	23.9 U	9960	46600
PCB-90/101/113	PCB-90/101/113	ng/kg	52500	9350	1370000	123000	2670000	1280000	111000	787 U	207000	788000
52663-61-3	PCB-92	ng/kg	8900	1660	243000	21300	467000	247000	19200	141 U	36100	140000
PCB-93/100	PCB-93/100	ng/kg	556	107	31000	3580	82200	51300	1580	47.9 U	4880	20700
73575-55-0	PCB-94	ng/kg	371	75.7	22400	2000	57900	58600	935	23.9 U	2780	15000
38379-99-6	PCB-95	ng/kg	32600	5630	1210000	118000	2240000	858000	70400	319 U	178000	761000
73575-54-9	PCB-96	ng/kg	267	45.1	35400	3710	67100	22100	890	23.9 U	4360	25600
PCB-98/102	PCB-98/102	ng/kg	2690	428	136000	12100	333000	263000	6290	47.9 U	19700	90300
38380-01-7	PCB-99	ng/kg	41700	7500	1070000	92600	2290000	1510000	90700	531 U	161000	594000
60145-21-3	PCB-103	ng/kg	293	52	12300	1060	22500	13500	625	23.9 U	1630	7390
56558-16-8	PCB-104	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
32598-14-4	PCB-105	ng/kg	48800	8720	1010000	92800	2270000	1290000	112000	1250 U	149000	543000
70424-69-0	PCB-106	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
70424-68-9	PCB-107	ng/kg	4900	907	110000	9010	242000	183000	11000	124 U	15100	58200
PCB-108/124	PCB-108/124	ng/kg	2870	522	59600	5430	129000	72700	6210	70.3	8850	32900
PCB-110/115	PCB-110/115	ng/kg	76000	13600	2000000	187000	3800000	1750000	152000	1190 U	293000	1080000
39635-32-0	PCB-111	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
74472-36-9	PCB-112	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
74472-37-0	PCB-114	ng/kg	2430	432	75000	6350	175000	115000	5810	79	10900	41600
31508-00-6	PCB-118	ng/kg	70700	12900	1530000	131000	3320000	2320000	161000	1710 U	217000	804000
68194-12-7	PCB-120	ng/kg	223 U	21.7 U	2340	1050 U	3960	4690	499 U	23.9 U	1080 U	2100 U
56558-18-0	PCB-121	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
76842-07-4	PCB-122	ng/kg	1550	249	31900	3280	67900	34100	3050	35.3	4530	17600
65510-44-3	PCB-123	ng/kg	2380	391	46800	4100	103000	62600	4860	53.7	7110	26000
57465-28-8	PCB-126	ng/kg	223 U	75.8	2510	1050 U	16000	11500	499 U	23.9 U	1080 U	2100 U
39635-33-1	PCB-127	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
PCB-128/166	PCB-128/166	ng/kg	4040	760	80100	7310	151000	98200	8930	115	9870	36000
PCB-129/138/163	PCB-129/138/163	ng/kg	25700	4740	472000	41400	988000	673000	53900	626 U	60800	216000
52663-66-8	PCB-130	ng/kg	1640	298	29300	2790	58700	44800	3280	37.1	3780	14200

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 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

CAS No.	Chemical	Location Sample ID Date Depth Unit	B-13	B-13	C-11	C-11	D-13B	D-13B	E-15	E-15	F-8	F-8										
			SB-B-13-A 7/8/2015 0 to 2 feet	SB-B-13-B 7/8/2015 2 to 4.3 feet	SB-C-11-A 6/15/2015 0 to 2 feet	SB-C-11-B 6/15/2015 2 to 6 feet	SB-D-13B-A 7/7/2015 0 to 2 feet	SB-D-13B-B 7/7/2015 2 to 6 feet	SB-E-15-A 7/7/2015 0 to 2 feet	SB-E-15-B 7/7/2015 2 to 6 feet	SB-F-8-A 6/18/2015 0 to 2 feet	SB-F-8-B 6/18/2015 2 to 6 feet										
61798-70-7	PCB-131	ng/kg	284	48.3	9320	1050	U	17700	10100	659	23.9	U	1210	4390								
38380-05-1	PCB-132	ng/kg	7900	1440	189000	16900		364000	207000	15700	142	U	23800	88800								
35694-04-3	PCB-133	ng/kg	339	58	5560	1050	U	9810	9160	625	23.9	U	1080	2510								
52704-70-8	PCB-134	ng/kg	1200	228	31000	2590		58500	35200	2400	23.9	U	4070	15500								
PCB-135/151	PCB-135/151	ng/kg	6560	1190	137000	12200		296000	187000	12700	125		18800	66600								
38411-22-2	PCB-136	ng/kg	2050	353	56700	5460		107000	49800	4020	30.5		7690	27900								
35694-06-5	PCB-137	ng/kg	1310	238	28300	2230		57600	46500	2980	33.4		3740	12700								
PCB-139/140	PCB-139/140	ng/kg	445	U	70.5	10000	2110	U	18900	13800	998	U	47.9	U	2160	U	4500					
52712-04-6	PCB-141	ng/kg	4290	768	87900	7750		194000	118000	8480	89.4		11200	41500								
41411-61-4	PCB-142	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
68194-15-0	PCB-143	ng/kg	223	U	21.7	U	3500		1050	U	14000	23800	499	U	23.9	U	1080	U	2100	U		
68194-14-9	PCB-144	ng/kg	809	136	21500	2020		45800	25800	1670	23.9	U	2960	10200								
74472-40-5	PCB-145	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
51908-16-8	PCB-146	ng/kg	2870	496	52400	4150		97500	76900	5480	67.7		6740	22600								
PCB-147/149	PCB-147/149	ng/kg	16600	3060	338000	29300		705000	430000	32300	309	U	46000	168000								
74472-41-6	PCB-148	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
68194-08-1	PCB-150	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
68194-09-2	PCB-152	ng/kg	223	U	21.7	U	2030	U	1050	U	3250	5350	499	U	23.9	U	1080	U	2100	U		
PCB-153/168	PCB-153/168	ng/kg	17300	3220	313000	26300		675000	451000	36000	377	U	41400	145000								
60145-22-4	PCB-154	ng/kg	223	U	30.5	3820	1050	U	6240	8700	499	U	23.9	U	1080	U	2100	U				
33979-03-2	PCB-155	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
PCB-156/157	PCB-156/157	ng/kg	3540	627	69100	5610		142000	104000	7920	95.4		8520	31900								
74472-42-7	PCB-158	ng/kg	2050	368	47800	4190		100000	68000	4860	55		6010	22200								
39635-35-3	PCB-159	ng/kg	223	U	21.7	U	3720	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U	
41411-62-5	PCB-160	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
74472-43-8	PCB-161	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
39635-34-2	PCB-162	ng/kg	223	U	21.7	U	2030	U	1050	U	2910	2100	U	499	U	23.9	U	1080	U	2100	U	
74472-45-0	PCB-164	ng/kg	1790	318	30500	2900		62400	39800	3420	42.8		3980	14800								
74472-46-1	PCB-165	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
52663-72-6	PCB-167	ng/kg	1060	189	17300	1570		36700	27300	2240	28.9		2350	8340								
32774-16-6	PCB-169	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
35065-30-6	PCB-170	ng/kg	4970	930	84700	7250		242000	184000	10100	126		10400	43800								
PCB-171/173	PCB-171/173	ng/kg	1210	232	24900	2270		66200	47900	2610	47.9	U	3300	12100								
52663-74-8	PCB-172	ng/kg	994	186	14500	1320		38900	30700	1840	24.2		1870	7320								
38411-25-5	PCB-174	ng/kg	5260	998	88200	7620		246000	175000	10100	116	U	11600	47600								
40186-70-7	PCB-175	ng/kg	223	U	27.5	3220	1050	U	8950	6650	499	U	23.9	U	1080	U	2100	U				
52663-65-7	PCB-176	ng/kg	466	81.9	10900	1050	U	26800	17400	914	23.9	U	1420	5020								
52663-70-4	PCB-177	ng/kg	3030	554	46700	4070		131000	97800	5750	68.8		6240	24600								
52663-67-9	PCB-178	ng/kg	1060	202	16300	1430		41100	31400	2010	26.5		2170	8000								
52663-64-6	PCB-179	ng/kg	1920	360	35600	3030		86300	57600	3610	43.3		5000	17800								
PCB-180/193	PCB-180/193	ng/kg	11000	2010	190000	15900		552000	413000	22200	274		23700	97700								
74472-47-2	PCB-181	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
60145-23-5	PCB-182	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
PCB-183/185	PCB-183/185	ng/kg	2830	521	56800	4840		157000	111000	5750	68.1		7450	29500								
74472-48-3	PCB-184	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
74472-49-4	PCB-186	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
52663-68-0	PCB-187	ng/kg	6430	1180	103000	8330		274000	205000	12400	166		13800	51100								
74487-85-7	PCB-188	ng/kg	223	U	21.7	U	2030	U	1050	U	2180	U	2100	U	499	U	23.9	U	1080	U	2100	U
39635-31-9	PCB-189	ng/kg	297	52	4380	1050	U	10400	8170	504	23.9	U	1080	2110								
41411-64-7	PCB-190	ng/kg	1180	220	18100	1560		51400	40200	2320	30.3		2230	9250								

TABLE F-1
ANALYTICAL RESULTS FOR POLYCHLORINATED BIPHENYLS CONGENERS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

CAS No.	Chemical	Location Sample ID Date Depth Unit	B-13	B-13	C-11	C-11	D-13B	D-13B	E-15	E-15	F-8	F-8
			SB-B-13-A 7/8/2015 0 to 2 feet	SB-B-13-B 7/8/2015 2 to 4.3 feet	SB-C-11-A 6/15/2015 0 to 2 feet	SB-C-11-B 6/15/2015 2 to 6 feet	SB-D-13B-A 7/7/2015 0 to 2 feet	SB-D-13B-B 7/7/2015 2 to 6 feet	SB-E-15-A 7/7/2015 0 to 2 feet	SB-E-15-B 7/7/2015 2 to 6 feet	SB-F-8-A 6/18/2015 0 to 2 feet	SB-F-8-B 6/18/2015 2 to 6 feet
74472-50-7	PCB-191	ng/kg	223 U	29.8	3350	1050 U	8980	6840	499 U	23.9 U	1080 U	2100 U
74472-51-8	PCB-192	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
35694-08-7	PCB-194	ng/kg	3190	602	53300	4530	165000	124000	6640	88.5	6390	27800
52663-78-2	PCB-195	ng/kg	1210	224	19200	1540	56600	43600	2410	34.7	2370	10100
42740-50-1	PCB-196	ng/kg	1160	209	23500	1950	66700	51200	2450	34.5	2850	11900
PCB-197/200	PCB-197/200	ng/kg	445 U	75.8	7290	2110 U	19300	14800	998 U	47.9 U	2160 U	4210 U
PCB-198/199	PCB-198/199	ng/kg	3560	674	52500	4570	162000	122000	7110	92.3	7020	27800
40186-71-8	PCB-201	ng/kg	241	45.9	5540	1050 U	15400	11400	560	23.9 U	1080 U	2780
2136-99-4	PCB-202	ng/kg	579	108	8330	1050 U	25200	18000	1160	23.9 U	1250	4830
52663-76-0	PCB-203	ng/kg	2150	390	31000	2600	100000	74600	4240	54.1	4160	17600
74472-52-9	PCB-204	ng/kg	223 U	21.7 U	2030 U	1050 U	2180 U	2100 U	499 U	23.9 U	1080 U	2100 U
74472-53-0	PCB-205	ng/kg	226	38.7	2840	1050 U	8240	6140	499 U	23.9 U	1080 U	2100 U
40186-72-9	PCB-206	ng/kg	1710 U	309	21000	2060	71500	53100	3120	38.5	3290	11900
52663-79-3	PCB-207	ng/kg	223 U	24	2190	1050 U	7030	5110	499 U	23.9 U	1080 U	2100 U
52663-77-1	PCB-208	ng/kg	406	73.4	4180	1050 U	17200	12500	697	23.9 U	1080 U	3190
2051-24-3	PCB-209	ng/kg	243	39.6	2030 U	1050 U	6840	5120	499 U	23.9 U	1080 U	2100 U
	Total PCBs	ng/kg	1297864	234883	58293390	6255200	1.14E+08	83795410	2821636	2524	7959020	49623670

Notes:

ng/kg = nanogram per kilogram

U = not detected

PCB = polychlorinated biphenyls

Total PCBs is based on total detected concentrations

TABLE F-2
ANALYTICAL RESULTS FOR DIOXINS AND FURANS
 Unimatic Manufacturing Corporation Superfund Site
 Fairfield, New Jersey

CAS No.	Chemical	TEF	Location Sample ID Date Depth Unit	B-13	B-13	C-11	C-11	D-13B	D-13B	E-15	E-15	F-8	F-8
				SB-B-13-A 7/8/2015 0 to 2 feet	SB-B-13-B 7/8/2015 2 to 4.3 feet	SB-C-11-A 6/15/2015 0 to 2 feet	SB-C-11-B 6/15/2015 2 to 6 feet	SB-D-13B-A 7/7/2015 0 to 2 feet	SB-D-13B-B 7/7/2015 2 to 6 feet	SB-E-15-A 7/7/2015 0 to 2 feet	SB-E-15-B 7/7/2015 2 to 6 feet	SB-F-8-A 6/18/2015 0 to 2 feet	SB-F-8-B 6/18/2015 2 to 6 feet
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01	ng/kg	26	5.43	26	20.5	88.8	52	125	4.15 J	39	63.8
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1	ng/kg	0.547 J	0.392 U	0.583 J	0.237 U	1.53 J	1.23 J	1.03 J	0.3 U	0.328 J	0.742 J
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1	ng/kg	1.06 J	0.388 U	1.39 J	0.619 J	4.45 J	3.68 J	3.9 J	0.206 J	0.7 J	1.5 J
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1	ng/kg	1.07 J	0.399 U	1.2 J	0.732 J	2.69 J	2.19 J	1.43 J	0.308 U	0.791 J	1.33 J
40321-76-4	1,2,3,7,8-pentachlorodibenzo-p-dioxin	1	ng/kg	0.794 J EMPC	0.26 J EMPC	1.19 J EMPC	0.747 J EMPC	2.63 J EMPC	2.26 J EMPC	0.704 J EMPC	0.159 J	0.502 J EMPC	1.64 J EMPC
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1	ng/kg	0.306 U	0.249 U	0.389 U	0.258 J EMPC	0.431 U	0.408 U	0.268 U	0.222 U	0.306 U	0.384 U
3268-87-9	Octachlorodibenzo-p-dioxin	0.0003	ng/kg	244	76.9	574	572	880	549	1340	54.8	4080 J	6620 J
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01	ng/kg	27.2	4.01 J	66.5	11	114	68.8	25.1	0.533 J	12.2	43.9
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01	ng/kg	2.09 J	0.395 U	9.12	0.895 J	21.4	14.2	2.1 J	0.235 U	2.22 J	10.7
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	0.1	ng/kg	12.2	1.75 J	53.1	4.39 J	86.5	52.5	6.13	0.159 J	10.6	47.5
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	0.1	ng/kg	4.99	0.675 J	20.8	2.41 J	31	20	2.9 J	0.138 U	3.97 J	16.3
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	0.1	ng/kg	1.01 J	0.298 U	6.55	0.519 J	12.4	8.33	0.695 J	0.189 U	1.84 J	8.66
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	0.03	ng/kg	6.46	0.998 J EMPC	25.1	4.4 J	33.7	22.8	3.96 J	0.231 U	4.8	19.9
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	0.1	ng/kg	4.39 J	0.657 J	16.8	2.17 J	29	17.4	2.59 J	0.0841 J	3.88 J	15.8
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	0.3	ng/kg	12.5	2 J	100	6.75	180	106	8.18	0.233 U	25.8	124
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	0.1	ng/kg	14.1	1.93	55.6	15.2	113	75.6	9.55	0.791 J	15.5	43.7
39001-02-0	Octachlorodibenzofuran	0.0003	ng/kg	23.6	3.29 J	68.6	13	179	109	76.4	2.01 J	16	63.8
	Total TCDD TEQ		ng/kg	9.435	1.6065	48.875	6.273	88.451	54.553	8.177	0.4097	13.991	56.27

Notes:

ng/kg = nanogram per kilogram

U = not detected

J = estimated value

J EMPC = estimated maximum possible concentration

TEF = toxicity equivalent factor for mammals

TCDD TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalence

Total TCDD TEQ is calculated using Kaplan-Meier method per United States Environmental Protection Agency guidance