Exponent®

Operable Unit 1 Final Human Health Risk Assessment: Ventron/Velsicol Site, Wood-Ridge/Carlstadt, New Jersey

Prepared for

Rohm and Haas Company
Chicago, Illinois

202563

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July 2005

Doc. no. 8600B3N.005 0103 0705 LY25

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Acronyms and Abbreviations

ALM	adult lead model
CDI	chronic daily intake
CoPC	chemical of potential concern
CSF	cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
GSD	geometric standard deviation
HHRA	human health risk assessment
IRIS	Integrated Risk Information System
NCP	National Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
OU1	Operable Unit 1
OU2	Operable Unit 2
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
RAGS	Risk Assessment Guidance for Superfund
RBC	risk-based concentration
Resolution	Resolution of the Berry's Creek/Wood-Ridge Site Action Committee
RfD	reference dose
RI/FS	remedial investigation and feasibility study
RME	reasonable maximum exposure
Stipulation	Stipulation and Supplementary Order Approving Cooperative Agreement for Remedial Investigation and Feasibility Study and Amending Procedural Order Involving Remedy
the site	Ventron/Velsicol site
UCL	upper confidence limit

Executive Summary

On behalf of Rohm and Haas Company, Exponent has prepared a human health risk assessment (HHRA) for the Ventron/Velsicol site (the site) located in Wood-Ridge and Carlstadt, New Jersey. The objective of the baseline HHRA is to quantify human health risks associated with chemicals of potential concern (CoPCs) in the absence of any remedial action (i.e., under the no-action alternative). This document constitutes Section 6 of the remedial investigation report for Operable Unit 1 (OU1) of the site (Exponent 2004) and relies on data collected during that investigation. This version of the HHRA updates the draft that was submitted in March 2005 (Exponent 2005) and reflects comments and responses to comments prior and subsequent to that submittal (U.S. EPA 2005c, 2005d; NJDEP 2001, 2003; Zervas 2004, pers. comm.; NJDEP and U.S. EPA 2002; Exponent 2001a, 2002).

The site is located in Bergen County, New Jersey, within the boroughs of Wood-Ridge and Carlstadt. In accordance with the New Jersey Department of Environmental Protection (NJDEP), the site has been divided into two operable units: Operable Unit 1 (OU1) and Operable Unit 2 (OU2). Only OU1 is addressed here. The two operable units together make up an irregularly shaped, approximately 38-acre parcel within an industrialized area of northeastern New Jersey. OU1 includes two areas: a 7-acre developed area and a 19-acre undeveloped area. The developed area is nearly entirely paved and has two active warehouses over what was the former mercury processing area. The undeveloped area was used as a dumping area for various materials including demolition material, domestic solid waste, and industrial and chemical waste from the former mercury processing facility. The undeveloped area includes the West Ditch and the onsite basin. South of the undeveloped area is a 12-acre marsh that is considered part of OU2. Surface water adjacent to the site, including Diamond Shamrock/Henkel Ditch (north), Nevertouch Creek, and Berry's Creek, will be evaluated with OU2; OU2 is not considered further herein. The site is designated as a National Priorities List site identified by U.S. Environmental Protection Agency (EPA) number NJD980529879, and bearing CERCLIS ID number 02C7.

Chemicals of Potential Concern

The HHRA used a conservative screening process to select CoPCs, to ensure that any chemicals that could be of concern were fully evaluated. All available chemical concentration data were reviewed for soil, groundwater, air, and sediments and water in OU1 ditches (i.e., onsite basin and West Ditch). In addition, data identified as hazardous waste samples were included in the HHRA as requested by NJDEP. Site concentration data were compared with conservative risk-based concentrations derived by EPA Region IX. A total of 41 CoPCs (or groups of CoPCs) were identified for further analysis in the HHRA, including one or more CoPCs identified in each of the media evaluated. Mercury was identified as a CoPC in all site media.

Exposure Assessment

The OU1 site under consideration includes a developed area, which is currently under commercial use, and an undeveloped area that would likely require fill in order to be developed. The Borough of Wood-Ridge has zoned the site area as "light industrial park" (Kolicko 1997, pers. comm.) and thus, future residential use is considered unlikely. Given the site characteristics, current use, and zoning regarding future use, the most likely potential human receptors include onsite workers and trespassers who might visit the site. Onsite workers are likely to be the receptor population with the highest exposure potential. However, because all groundwaters in the State of New Jersey are considered potable, groundwater CoPCs are evaluated in a future hypothetical residential drinking water scenario. The HHRA quantitatively evaluated site media for the following exposure pathways:

- **Surface soils in the developed area—**Incidental ingestion, and dermal contact with CoPCs by long-term workers and construction workers
- **Surface soils in the undeveloped area—**Incidental ingestion, dermal contact with CoPCs by long-term workers, construction workers, and trespassers who might visit OU1
- **Subsurface soils in the developed and undeveloped areas**—Ingestion and dermal contact with CoPCs in subsurface soils by construction workers
- **Surface water and sediments in OU1—**Incidental ingestion and dermal contact with surface water and sediment by an adult or older child trespasser who might contact CoPCs in the onsite basin and the West Ditch
- **Groundwater—**Ingestion of and dermal contact with CoPCs in groundwater are evaluated in hypothetical OU1-wide future long-term worker and resident scenarios
- **Outdoor air—**Inhalation of mercury vapor and chromium particulates in outdoor air by long-term workers in the developed or undeveloped area
- **Indoor air CoPCs migrating from subsurface soil or groundwater—** Inhalation of volatile contaminants in indoor air by long-term workers in the developed or undeveloped area
- **Indoor air CoPCs migrating from domestic groundwater—**Inhalation of volatile contaminants in indoor air during and after showering or bathing by residents who use groundwater for domestic drinking water.

Methods identified by EPA in risk assessment guidance documents were used to evaluate potential exposures. These scenarios are hypothetical rather than strictly representative of current or expected future site uses. In particular, use of OU1 groundwater as drinking water is highly unlikely, given the availability of other drinking water sources. Development of the undeveloped area for workplace use would require fill in many areas, so direct exposure to soil

is unlikely to occur. The exposure assumptions applied here have been developed to evaluate reasonable maximum future uses and to avoid underestimating exposures.

Toxicity Assessment

EPA toxicity values (i.e., cancer slope factors [CSFs] or reference doses [RfDs]) were identified for all CoPCs. Risk calculations were based on the current EPA toxicity values for all CoPCs. EPA extensively reviews and verifies RfDs and CSFs derived for risk assessment and, once posted in Integrated Risk Information System, they represent agency consensus. Mercury and arsenic were responsible for the majority of site risks. Arsenic risk, however, is likely to be at least partly related to naturally occurring arsenic in soils.

Risk Characterization and Conclusions

EPA toxicity values (i.e., CSFs or RfDs) were combined with exposure estimates to derive estimates of potential health risks related to exposure to CoPCs in media of OU1. Cancer risk estimates were compared to EPA's acceptable risk range of 1×10^{-6} to 1×10^{-4} established in the National Contingency Plan for Superfund sites (U.S. EPA 1990b). A 1×10^{-6} excess cancer risk represents an additional one-in-one-million probability that an individual may develop cancer over a 70-year lifetime as a result of the exposure conditions evaluated. Noncancer effects are expressed as the ratio of the estimated exposure, or intake rate over a specified exposure period, to the RfD derived for a similar exposure period. This ratio is termed a hazard quotient. Exposures resulting in a hazard quotient less than or equal to 1 are unlikely to result in noncancerous adverse health effects.

Cancer Risk Estimates—Estimated total cancer risks for both reasonable maximum exposure (RME) and central tendency scenarios were within the 10^{-6} to 10^{-4} target risk range identified above, with one exception. The future hypothetical residential use of drinking water had a risk estimate of 4×10^{-4} (i.e., with ingestion, inhalation, and dermal contact combined). Specific results were as follows:

For the developed area:

- Under current conditions in the developed area, the long-term worker had a total risk estimate of 3×10^{-5}, resulting primarily from estimated concentrations of benzene in indoor air (from soil), and arsenic and polycyclic aromatic hydrocarbons (PAHs) in soil.
- Under hypothetical future conditions in the developed area, the long-term worker scenario had a total risk estimate of 3×10^{-5}, including the risk estimates identified above related to indoor air and soil exposures. The future worker also had assumed exposure to CoPCs through consumption of groundwater as drinking water, which had a risk estimate of 6×10^{-5}, primarily related to arsenic and benzene in water for a total rounded risk estimate for long-term workers of 9×10^{-5}.

For the undeveloped area:

- Under hypothetical future conditions in the undeveloped area, the RME risk estimate for a long-term worker's exposure to soil via ingestion, dermal contact, and inhalation was 3×10^{-5} related primarily to arsenic, PAHs, and polychlorinated biphenyls (PCBs). In addition, the risk estimate for consumption of groundwater was 6×10^{-5}, related primarily to arsenic and benzene in groundwater, for a total rounded risk estimate for long-term workers of 9×10^{-5}.

- The highest risk estimates for current or future trespassers to the undeveloped area were 4×10^{-5}, for ingestion of and dermal contact with soils. The highest total risk estimate for trespassers' exposure to sediments in the West Ditch or the onsite basin was 2×10^{-5}. Risks for the trespasser scenarios were also related primarily to arsenic, PAHs, and PCBs in soil and arsenic and PAHs in sediments.

- There were no carcinogenic CoPCs in surface water.

For the developed and undeveloped area:

- Risk estimates for the construction workers were 4×10^{-7} in the developed area and 5×10^{-6} in the undeveloped area including exposures to CoPCs in subsurface soils via ingestion and dermal contact.

Hypothetical residential use of groundwater

- The highest risk estimate for the hypothetical residential use of drinking water scenario was 4×10^{-4}, primarily related to hypothetical ingestion of arsenic in drinking water and inhalation of benzene volatilized during showering or bathing.

Noncancer Risk Estimates—For noncarcinogens, in current scenarios, current trespasser exposure scenarios in the undeveloped area had hazard indices greater than 1. These ranged from 1.4 to 3.4 and were primarily related to mercury in soil and sediment. In the future scenarios, the long-term worker, the adult and child trespasser scenarios, and the hypothetical residential use of groundwater all had hazard indices greater than the threshold of 1.

Results for the future scenarios for the long-term worker were as follows:

- In the developed area a hazard index of 2.3 was calculated for the long-term worker's ingestion of surface soil, based almost entirely on mercury in soil. Calculation of the hazard index including the hot spot value of 13,800 mg/kg at SS-04 and a fractional intake of 0.1 resulted in a hazard index of 0.76.

- The developed area construction worker scenario had a hazard index of 7.8, based almost entirely on exposure to mercury in subsurface soils.
- Mercury in soil was also the primary contributor to a hazard index of 1.1 for long-term worker's exposure to surface soil in the undeveloped area. Calculation of the hazard index including the hot spot value of 295,000 mg/kg and a fractional intake of 0.1 resulted in a hazard index of 14, based primarily on mercury in soil.
- Future hypothetical workplace ingestion of groundwater site-wide had a hazard index of 2.5 based on manganese, thallium, mercury, and arsenic.
- The hazard estimate for inhalation of chemicals volatilizing from soil into indoor air (naphthalene and xylene) was 5.7 in the undeveloped area.
- The total hazard indices for future long-term workers in the developed and undeveloped areas were 5.2 and 9.6, respectively, related to mercury in soils and mercury and other metals in water.

The future trespasser scenarios were assumed to be the same as the current scenarios described above, so the hazard indices are the same as those described for the current scenario.

Finally, the hypothetical residential use of drinking water scenario had total hazard indices of 23 for adults and 75 for children. In each scenario, approximately one third of the total hazard index was related to ingestion of groundwater and two thirds of the estimate was related to inhalation of volatile CoPCs during showering or bathing. The groundwater consumption estimates were related to manganese, thallium, mercury, and arsenic, while the inhalation estimates were primarily related to naphthalene with some contribution from 4-methylphenol, benzene, toluene, and xylenes.

Although the risk and hazard estimates for several hypothetical pathways exceeded the acceptable target range identified by EPA, these findings should be considered within the context of the uncertainties related to the estimation methods.

Mercury and arsenic were responsible for the majority of site risks. The potential for overestimation of OU1 risks related to exposure assumptions, and to the toxicity value for mercury derived through application of a 1,000-fold uncertainty factor, suggests that the actual hazard quotient may be somewhere within a range that is represented by the hazard quotient plus or minus the uncertainty factor.

Hazard evaluation for lead—Application of the adult lead model (ALM) resulted in predicted blood lead levels in the most sensitive population (developing fetus) greater than the acceptable level in two scenarios:

- Hypothetical exposure of pregnant female workers to surface soils in the undeveloped area based on the average value of 2,110 mg/kg, which included the outlier value of 47,600 mg/kg, resulted in an estimated geometric mean

blood lead in the fetus of pregnant women of 15 μg/dL, with a 15 percent chance of exceeding the target blood lead level of 10 μg/dL.

- The ALM estimate for pregnant female construction workers in the undeveloped area subsurface soils, which was based on the exposure point concentration of 2,096 mg/kg, resulted in an estimated geometric mean blood lead in the fetus of pregnant women of 16 μg/dL, with a 16 percent chance of exceeding the target blood lead level of 10 μg/dL.
- Remaining estimates derived by the ALM were within the target level of no greater than a 5 percent chance of exceeding the target blood lead level of concern of 10 μg/dL.

The findings of the baseline risk assessment were taken into account in the development of remedial action objectives and remedial alternatives for soil and groundwater presented in the feasibility study (CH2M Hill 2005).

1 Introduction

On behalf of Rohm and Haas Company, Exponent has prepared a human health risk assessment (HHRA) for the Ventron/Velsicol site (the site) located in Wood-Ridge and Carlstadt, New Jersey. The objective of the baseline HHRA is to quantify human health risks associated with chemicals of potential concern (CoPCs) in the absence of any remedial action (i.e., under the no-action alternative). This document constitutes Section 6 of the remedial investigation report for Operable Unit 1 (OU1) of the site (Exponent 2004) and relies on data collected during that investigation. This version of the HHRA updates the March 15, 2005, version (Exponent 2005) and reflects comments and responses to comments provided prior and subsequent to that submittal (U.S. EPA 2005c, 2005d; NJDEP 2001, 2003; Zervas 2004, pers. comm.; NJDEP and U.S. EPA 2002; Exponent 2001b, 2002).

The assessment was conducted consistent with U.S. Environmental Protection Agency (EPA) and New Jersey Department of Environmental Protection (NJDEP) guidance, with the 1996 work plan for the site (CRA 1996), and with ongoing communication between Exponent staff and EPA and NJDEP on behalf of Rohm and Haas. The final remedial investigation report was submitted in June 2004 (Exponent 2004), and the feasibility study was submitted in May 2005 (CH2M Hill 2005). An ecological risk assessment was submitted in 2001 (Exponent 2001a) and is currently under review.

The risk assessments are part of the remedial investigation and feasibility study (RI/FS) required by the Resolution of the Berry's Creek/Wood-Ridge Site Action Committee (Resolution) with NJDEP, executed on August 15, 1996. The Resolution is an amendment to the October 26, 1984, Stipulation and Supplementary Order Approving Cooperative Agreement for Remedial Investigation and Feasibility Study and Amending Procedural Order Involving Remedy (Stipulation). The Stipulation covers the approximately 38-acre site and the areas of Berry's Creek that are potentially affected by industrial activity at the site, while the Resolution provides for implementation of a separate RI/FS for the site. The site is designated as a National Priorities List site identified by EPA number NJD980529879, and bearing Comprehensive Environmental Response, Compensation and Liability Information System ID number 02C7.

This document presents the results of the HHRA for OU1 of the site and it supplements the remedial investigation for the site (Exponent 2004). This HHRA was conducted using analytical results from samples of soil, groundwater, water from seeps, sediments, and air collected during Phase I, Phase IA, and Phase 1A supplemental field investigations. The HHRA also draws on information presented in the remedial investigation report on site background, hydrology, climate, and demographics. This HHRA is structured in accordance with the guidance for risk assessment as discussed in the specific sections on HHRA (Section 3) under EPA's Comprehensive Environmental Response, Compensation and Liability Act of 1980 (U.S. EPA 1988) and within NJDEP. This section provides a brief description of the site, applicable guidance documents, and the organization of this report and appendices. Section 2 describes the conceptual model, and the remainder of the report describes the methods and findings of the HHRA.

1.1 Site Description

The site is located in Bergen County, New Jersey, within the boroughs of Wood-Ridge and Carlstadt (Figure 1-1). In accordance with instructions in an April 1, 1999, letter from NJDEP (Zervas 1999, pers. comm.), the site has been divided into two operable units: OU1 and Operable Unit 2 (OU2) (Figure 1-2); only OU1 is addressed here. The two operable units together make up an irregularly shaped, approximately 38-acre parcel within an industrialized area of northeastern New Jersey. Approximately 15.7 of the 38 acres are within the Borough of Wood-Ridge, and the remaining 22.6 acres are within the Borough of Carlstadt. The entire site is generally within the Hackensack Meadowlands area. The site is bordered to the east by Berry's Creek; to the west by the West Ditch, the Diamond Shamrock/Henkel and Randolph Products properties, and Park Place East; to the south by the Diamond Shamrock/Henkel Ditch (south) and Nevertouch Creek; and to the north by Ethel Boulevard and a railroad track (Figure 1-2). Two active commercial/industrial facilities and a lot, on which a publicly owned treatment works was formerly located, lie immediately north of Ethel Boulevard and the railroad track. The railroad crosses Berry's Creek at the northeast corner of the site and continues south along the eastern side of Berry's Creek.

Land use in the immediate vicinity of the site is primarily commercial/industrial. The closest residential area is approximately 750 ft to the north of the site (Figures 1-1 and 1-2). Teterboro Airport is approximately 0.6 mile to the north, State Highway 17 is approximately 500 ft to the west, and the Meadowlands Sports complex is approximately 1 mile to the south. The immediately adjacent Diamond Shamrock/Henkel property is undergoing an active remediation program under the NJDEP Environmental Cleanup Responsibility Act. Warehouses occupy the land on the other side of Berry's Creek, east of the facility.

Groundwater hydrology is described in Section 3 of the remedial investigation report. Groundwater at the site discharges toward Berry's Creek. As with all groundwater in the state, site groundwater is designated by the State of New Jersey as potable. Berry's Creek is included on New Jersey's Clean Water Act Section 303(d) list for toxic pollutant impairment (www.epa.gov/fedrgstr/EPA-WATER/2001/October/Day-09/w25258.htm). Other surface water bodies identified in OU1 (i.e., the onsite basin and the West Ditch) are very small and do not have surface water designations. Additional information on topography and surface features, climate and meteorology, geologic setting, soils, hydrology, hydrogeology, ecology, demography, and land use is available in the remedial investigation report (Exponent 2004).

As indicated above, the site is divided into two units—OU1 and OU2—and only OU1 is evaluated herein. OU1 includes two areas—one developed and one undeveloped (Figure 1-2) and includes the West Ditch and the onsite basin. All other surface water including Diamond Shamrock/Henkel Ditch (north), and Berry's Creek will be evaluated with OU2. The developed portion of OU1 covers approximately 7 acres and includes two active warehouses—the Wolf and U.S. Life Warehouses (Figure 1-2). The former mercury processing facility was located on the portion of OU1 that is now occupied by these warehouses. The remainder of the developed area of OU1 is covered with asphalt pavement or with gravel, which forms the bed for railroad tracks located immediately behind the warehouses. The only soil in the developed area that is not covered by pavement is beneath the gravel bed of these railroad tracks. Drainage from the

developed area is directed generally between the two warehouses and the Randolph Products property, and it flows into the West Ditch (Figure 1-2) along the western property boundary.

The undeveloped area of OU1 lies generally south of the developed area and includes approximately 19 acres of land that was filled but not developed. According to the remedial investigation report (Exponent 2004), the sources of fill included demolition material, domestic solid waste, and industrial and chemical waste from the former mercury processing facility. The surficial fill is described in the remedial investigation report as consisting of gravel, sand, silt, and clay, with shale fragments as well as glass, brick, cinders, porcelain, wire, leather, cloth, coal, chemical matter, wood, shingles, rubber, plastic, metal, and other debris. The fill ranges in thickness from 2 ft in the developed area to a maximum of 21 ft near the center of the undeveloped filled area.

This portion of OU1 is bordered to the north by the railroad track, to the south by the Diamond Shamrock/Henkel Ditch (north), to the west by the West Ditch, and to the east by Berry's Creek (Figure 1-2). The undeveloped filled area of OU1 is characterized by mixed vegetation and a variety of surficial debris. Much of this area is relatively flat, but the northeast portion has uneven terrain. Two surface features are a small pit, which may include remnants of an access structure for the drainage system from the Plant area that extended to Berry's Creek, and a small basin, hereafter referred to as the onsite basin. The onsite basin may be a remnant of a settling basin for discharges from the Plant area or the Randolph Products property (Figure 1-2). The east and south perimeters of this area are steep stream banks adjacent to Berry's Creek and the Diamond Shamrock/Henkel Ditch (north), respectively. The north and west perimeters of the area are fenced; additional fencing to the east prevents site access via the tide gate.

The remaining 12 acres of the site are within OU2 and consist of a marsh area located south of the undeveloped filled area (Figure 1-2); OU2 is not considered further herein.

1.2 Applicable Guidance

The risk assessment was conducted in accordance with current NJDEP and EPA guidance, including, but not limited to, the following documents:

- *Soil Cleanup Criteria.* www.state.nj.us/dep/srp/regs/scc/index.html. Provided by the State of New Jersey, Department of Environmental Protection, Trenton, NJ. These values have not been promulgated but will be considered during the compilation of applicable or relevant and appropriate requirements.
- *Risk Assessment Guidance for Superfund: Volume 1 — Human Health Evaluation Manual* (Parts A and D) (U.S. EPA 1989, 1998)
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors"* Interim Final (OSWER Directive # 9285.6-03) March 1991
- *Exposure Factors Handbook* (U.S. EPA 1997a)

- EPA Region IX preliminary remediation goals (PRGs) table (U.S. EPA 2005a)
- *Risk Assessment Guidance for Superfund Supplemental Guidance for Superfund, Volume I: Human Health Evaluation Manual. Part E, Supplemental Guidance for Dermal Risk Assessment* (U.S. EPA 2004).
- *Supplemental Guidance to RAGS: Calculating the Concentration Term* (U.S. EPA 1992) and *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (U.S. EPA 2002a)
- Johnson and Ettinger model software developed by U.S. EPA (2002b) and Andelman Model as modified by Schaum et al. (1994)
- *Guidance for Data Usability in Risk Assessment* (U.S. EPA 1990a).

Most of these documents were included in the revised list of guidance documents submitted to NJDEP in January 2001 (Hock 2001, pers. comm.). In some cases, more recent documents were requested by NJDEP/EPA in comments on the draft HHRA (NJDEP 2001, 2003), or in subsequent communications.

1.3 Organization

Site background information and applicable guidance documents were summarized in Sections 1.1 and 1.2. Sections 2 through 6 describe the results of the four steps recommended in EPA guidance for risk assessment:

- Data evaluation and identification of CoPCs
- Exposure assessment
- Toxicity assessment
- Risk characterization.

An uncertainty assessment is included in the risk characterization to place potential risks in context. The uncertainty assessment discusses HHRA assumptions that may lead to over- or underestimates of potential site risks. The following supporting information is provided in appendices to the HHRA:

- **Appendix A, EPA Risk Assessment Guidance for Superfund (RAGS) D Tables—**This section provides all tables required in the RAGS Part D Tables 1–10. These tables present all quantitative aspects of the HHRA including: data summaries and the basis for selecting CoPCs; exposure assessment assumptions (i.e., derivation of exposure point concentrations [EPCs], exposure parameter assumptions); risk estimates for each CoPC in each

potentially complete exposure pathway; and cumulative risk estimates for each receptor in each scenario.

- **Appendix B, Region IX Tables of Screening Values**—Provides tables of EPA-derived risk-based concentrations (RBCs) used in the selection of CoPCs (U.S. EPA 2005a) (as requested by EPA Region II).
- **Appendix C, Additional Modeling Documentation—**Provides additional tables and documentation on both the Johnson and Ettinger modeling and the Andelman modeling.
- **Appendix D, Adult Lead Model Methods and Results—**Presents tables providing input parameters and results of adult lead model (ALM) estimates for soils.
- **Appendix E, ProUCL 3.0 Output Files—**Provides detailed output files for ProUCL calculations, used to derive EPCs in the HHRA. This appendix is provided only in the copy for EPA to assist in detailed review.

2 Conceptual Site Model

In January 2001, Exponent submitted a draft human health and ecological conceptual site model for OU1 of the site on behalf of Morton International and Velsicol Chemical Corporation (Henry 2001, pers. comm.). This conceptual site model was developed based on site history, site conditions, and the analytical results of site media samples presented in the remedial investigation report (Exponent 2004). The conceptual site model has been updated based on input from NJDEP and EPA. The conceptual site model identifies potential sources, transport mechanisms, exposure media, exposure routes, and human and ecological receptors. These elements of the conceptual site model are summarized below, followed by a discussion of the relationships among these elements. Figure 2-1 provides an overview of the conceptual site model for human receptors. In addition, Sections 4 and 5 of the remedial investigation report provide a detailed description of the nature and extent of contamination, and of the transport and fate of CoPCs, respectively.

2.1 Sources and Transport Pathways

As described in the remedial investigation report, possible sources of CoPCs were former operations within the developed areas and direct disposal of wastes and fill in the undeveloped area. The main operations within the developed area were the manufacture and reclamation of mercury compounds. Metals and any other process-related chemicals could have been deposited on soils through leaks, spills, and past waste handling practices. The undeveloped area (an approximately 19-acre area between the developed area and Berry's Creek) was used as a disposal area for various materials, including demolition material and domestic solid waste.

Possible release mechanisms for the CoPCs include potential spills and leaks of chemicals managed in the developed area (although none have been documented) and previous activities in the area. Within the undeveloped area, release mechanisms include direct disposal and subsequent leaks from any containers. Where releases to soil occurred, the secondary transport mechanisms for CoPCs include potential infiltration and percolation to subsurface soil and shallow groundwater, stormwater runoff, and windborne dust and/or volatile emissions.

Offsite transport of chemicals in soil via stormwater runoff or in groundwater may have resulted in releases to surface water within OU1 (i.e., the West Ditch and the onsite basin), or to OU2 (i.e., the Diamond Shamrock/Henkel Ditches [north or south] and Berry's Creek). Potential exposure media in the West Ditch and the onsite basin include sediments and surface water. No fish have been observed in these surface waters, nor does this appear to be suitable habitat for consumable fish. The West Ditch carries drainage runoff from the developed area and is completely dry for extended periods. Potential risks to ecological receptors in the West Ditch are discussed in the ecological risk assessment (Exponent 2001a). Offsite transport to OU2 including potential impacts on sediments, water, and biota will be evaluated in the RI/FS for OU2.

Volatilization of chemicals from soil or shallow groundwater to indoor or outdoor air, and to a lesser extent, the suspension of fine soil particulates, are also potential transport pathways. Because of the presence of soil coverage within the developed area, air pathways are expected to be less significant than direct-contact pathways (i.e., ingestion and dermal absorption). However, both outdoor and indoor air pathways are evaluated in the HHRA.

2.2 Potential Human Receptors and Pathways

A complete exposure pathway exists only when a receptor population can be exposed to chemical constituents associated with the site. OU1 is currently under commercial use within the developed area and is fallow within the undeveloped area. Wood-Ridge has zoned this area as "light industrial park" (Kolicko 1997, pers. comm.), so future residential use is considered unlikely. The current potential for exposure to site media is low, because the undeveloped portion of the site is fenced on three sides, and because the developed area is largely covered by buildings and pavement.

At least one CoPC has been detected in OU1 soil, groundwater, sediments, surface water, and outdoor air. In addition, modeling estimates were used to derive hypothetical indoor air concentrations for volatile CoPCs in soil and groundwater. The potential for receptors to contact CoPCs in each of these media and in indoor air was evaluated in the HHRA. Table 1 of Appendix A summarizes all potential exposure pathways and Figure 2-1 is a schematic representation of these potential exposure pathways.

Given the characteristics of the property, including current use and zoning regarding future use, the most likely potential human receptors include onsite workers and trespassers who might visit the site. Onsite workers (including long-term workers and construction workers) are likely to be the receptor population with the highest exposure potential. Future onsite residential use of this site is highly unlikely. However, because site groundwater is designated as potable drinking water by the State of New Jersey, use of groundwater as domestic drinking water is evaluated in a hypothetical scenario. Although offsite residents could potentially inhale fugitive dust generated from the site, the magnitude of exposure via this pathway would be far less than for onsite workers.

2.2.1 Current and Future Workers

Current and future onsite worker scenarios were evaluated for the developed area, in which workers are exposed to CoPCs in surface soil, subsurface soil, groundwater, and to mercury in outdoor air. Volatilization of CoPCs from soil or groundwater to indoor air was also evaluated. As indicated above, the developed area is nearly all paved. Therefore, in the current scenario for the developed area, only unpaved soils were considered. In contrast, a future worker scenario for the developed area included consideration of paved and unpaved soils to evaluate risks associated with contact with all soils including those currently under pavement. A future worker scenario was also evaluated for the undeveloped area. Although future development is unlikely to take place without surface soil modification (i.e., adding fill, which would reduce CoPC concentrations), such use was evaluated in a hypothetical scenario for purposes of the risk

assessment. Pathways evaluated for current and future long-term worker contact with CoPCs in surface soil included ingestion and dermal contact. In addition, exposure to mercury in outdoor air, and to volatile constituents from soil or groundwater in indoor air were also evaluated. Risks associated with exposure to CoPCs in subsurface soil were evaluated through a current and future trench worker scenario, in which workers contact CoPCs in subsurface soil through incidental ingestion and dermal contact.

As discussed above, site groundwater is not used as drinking water, and such use is not expected and is highly unlikely in the future. However, to determine whether use of groundwater as drinking water could result in unacceptable risks, ingestion and limited dermal contact with CoPCs in groundwater were evaluated for workers in a hypothetical future scenario.

2.2.2 Trespassers

The most likely current receptor within the undeveloped area would be a trespasser who might gain access. Potential exposure pathways would include ingestion of and dermal contact with surface soil, sediments, and surface water within the undeveloped area. The most likely human populations to trespass in and around the undeveloped area are adults and older children (i.e., 9–18 years old). Younger children would not be expected to visit these areas given the limited access.

Although it is hypothetically possible for chemicals in site soil and surface water to be taken up into plants or into aquatic organisms consumed by trespassers, these pathways are considered incomplete because of site characteristics, the quality of the vegetation, and conditions at the site. During the site visits, no edible plants were noted. The surface water within the OU1 area, the West Ditch, and the onsite basin was determined not to support fish or other aquatic organisms that would be consumed by people. Therefore, this pathway is not considered complete.

2.2.3 Future Hypothetical Domestic Use of Drinking Water

As described above, although the site is currently industrial and this use is expected to continue in the future, the aquifer is defined by the State of New Jersey as potable for residential purposes. Therefore, in order to evaluate the highest possible future use of groundwater, groundwater CoPCs are evaluated in a future hypothetical residential drinking water scenario. This analysis included evaluation of ingestion, dermal contact, and inhalation of CoPCs that might volatilize from groundwater during bathing or showering.

3 Data Analysis and Identification of Chemicals of Potential Concern

Data presented in the remedial investigation report (Exponent 2004, Appendix B) were the basis of the risk assessment. These data and the comparisons with screening concentrations are presented in Appendix A, RAGS D Tables 2.1 through 2.10. The HHRA uses a conservative screening process to select CoPCs to ensure that any substances that could be of concern are evaluated fully. All available chemical concentration data were reviewed to identify CoPCs in the following media:

- Surface soil/sediments
- Subsurface soil
- Surface water
- Groundwater
- Air.

As described in the remedial investigation report (Exponent 2004), drums and test pits containing waste material were sampled and analyzed during the remedial investigation. Although these materials were not entirely soil, site users could contact the material because it was collected on the soil surface. Therefore, these data were included in the screening and risk calculations conducted in this HHRA. Some of the samples were characterized as hot spots based on very high sample concentrations (i.e., more than 100 times the screening RBC) and are discussed further in Section 4.

Tables 2.1 through 2.9 of Appendix A provide a summary of OU1 data. These tables present the occurrence, distribution, and selection of CoPCs and provide the following information as specified in U.S. EPA (1998):

- Chemicals detected and undetected in each medium
- Frequency of detection of chemicals in each medium
- Range of detected concentrations for each chemical in each medium
- Range of detection limits for the chemicals in each medium
- Background screening values for metals in urban coastal plain soils in New Jersey (Sanders 2003). These do not constitute a site-specific background data set and are provided here for comparison only.
- Screening concentrations (i.e., RBCs), when available, for exposure to residential soil, for residential use of drinking water, or for inhalation.

Table 3-1 shows a simple summary of CoPCs identified in site media. Appendix A Tables 3.1 through 3.13 present EPCs calculated for each CoPC in each exposure medium, and additional supporting documentation consistent with EPA guidance (U.S. EPA 1998). Figure 3-1 shows sample locations for data used in the HHRA. The following sections describe how OU1 data were used to identify CoPCs.

Maximum concentrations of analytes in OU1 media were reviewed to compile a list of CoPCs for human health.[1] The methods used to select CoPCs were intended to ensure that no contaminants detected at levels of potential health concern would be excluded. Maximum concentrations of contaminants in all media were compared with conservative RBCs derived by EPA. RBCs used in this screening process were developed by EPA Region IX. The RBCs for soil account for three potential exposure routes: ingestion, inhalation of particles or vapors, and dermal contact. The RBCs for tap water account for ingestion of water and inhalation of volatile contaminants from water. RBCs for ambient air (in a residential setting) were used to screen the air data (U.S. EPA 2005a). The RBCs correspond to either a 1×10^{-6} excess cancer risk (for carcinogens) or a hazard quotient of 0.1 (for noncarcinogens), whichever is more stringent. Appendix B includes copies of the original sources of EPA RBCs used in screening CoPCs.

Mercury exists in the environment in both organic and inorganic forms. Methylmercury, the species of greatest concern because of its potential toxicity and ability to bioaccumulate, is generally present at concentrations significantly lower than total mercury concentrations in soil, sediment, and groundwater. In surface waters, methylmercury usually constitutes a small fraction of the total mercury (e.g., 5–15 percent in Wisconsin lake surface waters [Watras et al. 1994]). Site-specific data confirm these general assumptions. Total mercury and methylmercury data for all media are presented in Appendix B of the remedial investigation report (Exponent 2004) and methylmercury as a percent of total mercury was reported in Figures 4-1 and 4-2 of the remedial investigation report. In the discussion below, ranges, means, and medians were determined from these figures.

Figure 3-2 (originally presented as Figure 4-1 in the remedial investigation report) shows both the concentration of methylmercury and methylmercury as a percent of total mercury in surface soil and sediment in the undeveloped area. In the undeveloped area, in nine samples of surface soil that had both total and methylmercury data (N=9), methylmercury as a percent of total mercury ranged from 0.0027 to 0.098 percent with a mean of 0.036 percent and a median of 0.043 percent. In OU1 surface sediment (i.e., sediment in the West Ditch and the ponded area), methylmercury as a percent of total mercury ranged from 0.0077 to 0.076 percent with a mean of 0.039 percent and a median of 0.043 percent (N=5). Methylmercury was not measured in developed area soils.

Figure 3-3 (originally presented as Figure 4-14 in the remedial investigation report) shows both the concentration of methylmercury and methylmercury as a percent of total mercury in groundwater and surface water at the site. In groundwater samples that had both total and

[1] All chemicals except lead were evaluated based on maximum concentrations. Lead in site media was evaluated based on average concentrations consistent with the use of average inputs in the EPA integrated exposure uptake/biokinetic model.

methylmercury data, methylmercury as a percent of total mercury ranged from 0.0059 to 14 percent with a mean of 1.9 percent and a median of 0.48 percent (N=20). In OU1 surface water (i.e., the West Ditch and the ponded area), methylmercury as a percent of total mercury ranged from 0.012 to 0.48 percent with a mean of 0.22 percent and a median of 0.15 percent (N=5). Despite the generally low concentrations of methylmercury relative to total mercury in all media, mercury data were screened based on RBCs for methylmercury, consistent with a request from EPA.

Data on site-specific background concentrations of inorganic chemicals were not available. Comparison of maximum site concentrations with samples collected from background locations in New Jersey soils as described in Sanders (2003) suggests that site concentrations for some inorganic chemicals are within levels typically identified in background soils. EPA staff have indicated that chemicals should not be screened out of the risk assessment based on their presence at background concentrations. Instead, the concentration relative to background can be considered as part of risk management decision-making at the site (Sivak 2001, pers. comm.). The uncertainty assessment includes a discussion of site concentrations relative to background concentrations. As indicated there, some of the risks identified in the assessment may be related to naturally occurring chemicals in soil. The contribution to site risks related to background concentrations should be considered in evaluating the need for site remediation or site controls.

Maximum detected concentrations of chemicals in surface soil/sediments and subsurface soils in the developed and undeveloped areas were compared with EPA-derived RBCs for residential soil as a conservative means of evaluating direct contact with these media. Use of the RBCs derived for residential soil to screen for CoPCs in these media is highly conservative, because these values are based on daily contact with soil in a residential scenario, whereas exposures to soil/sediments would be restricted to occasional contact during trespassing activities, or short durations during construction activities. Such exposures would be expected to be less frequent than exposures that a child might receive at a residence. Consequently, the use of residential screening numbers is expected to provide a conservative (i.e., health protective) means to screen the site data to identify CoPCs for nonresidential uses evaluated in the HHRA.

Maximum chemical concentrations in surface water (the onsite basin and the West Ditch) and OU1 groundwater were compared with their respective RBCs, derived by EPA based on assumed levels of exposure resulting from the use of water as a residential drinking water source. This method is expected to be a health protective screening procedure for identifying CoPCs, because no site surface water or groundwater is used for drinking water. Similarly, concentrations of mercury detected in outdoor air were screened through comparison with an RBC derived on the basis of exposure to air in a residential setting (U.S. EPA 2005a).

Consistent with guidance contained in U.S. EPA (1989), data were also evaluated in light of the following considerations:

- Although EPA indicates that chemicals can be excluded based on frequency of detection, no chemicals were excluded on this basis, because no chemicals that were detected had low detection frequencies.

- A compound can be eliminated from consideration if it is an essential nutrient, present at low concentrations, and toxic only at high doses. Consistent with EPA guidance (U.S. EPA 1989), several essential nutrients (i.e., calcium, magnesium, potassium, sodium) were not included as CoPCs.
- If common laboratory chemicals (e.g., acetone, methylene chloride, toluene, phthalate esters) are found at less than 10 times the maximum concentration detected in any blank, or if other chemicals are found at less than 5 times the maximum concentration detected in any blank, these chemicals can be eliminated. No chemicals were excluded on this basis.

After consideration of the issues described above, chemicals were identified as CoPCs if the maximum concentration detected in an environmental medium exceeded the respective RBC.

3.1 Soil and Sediment

The soil data were considered in four groups: surface soils in the developed area, surface soils in the undeveloped area, and subsurface soils in the developed and undeveloped areas. Data for sediment samples in the undeveloped area constituted a fifth data group that was also screened for CoPCs. The screening of these data is discussed in the following sections.

3.1.1 Surface Soils in the Developed Area

Up to 15 samples were collected from the developed soil area at 0–12 in. deep. Because the developed area is nearly all paved, only three of these samples were from unpaved areas (SS-14, SS-15, SS-16); these samples were collected under gravel in the railroad bed. As described above in the conceptual model, the unpaved soils within the developed area were considered in a current worker scenario, while unpaved and paved soils together were considered in a future scenario. Therefore, given these different expected exposure patterns for current and future use, separate EPCs were calculated for the combined paved and unpaved soils and for the unpaved soils alone.

Six metals were identified as CoPCs in surface soils within the unpaved soils in the developed area: arsenic, chromium, copper, manganese, mercury, and vanadium. Three polycyclic aromatic hydrocarbon (PAH) compounds exceeded their RBCs and were identified as CoPCs: benzo[b]fluoranthene, benzo[a]pyrene, and dibenz[a,h]anthracene. All other organic compounds were found in concentrations less than their RBCs (Tables 2.1 and 3.1 in Appendix A).

Considering the paved and unpaved soils together, all the same CoPCs were found, with the addition of three other CoPCs. Thallium, benz[a]anthracene, and benzene were also present at concentrations greater than their RBCs and were included as CoPCs within the future scenario for exposure to paved and unpaved soil together within the developed area (Tables 2.2 and 3.1 in Appendix A).

3.1.2 Surface Soils and Sediment in the Undeveloped Area

Up to 45 samples were collected from the undeveloped soil area at the 0- to 12-in. depth. These included sediment samples collected at five locations in the onsite basin, and the West Ditch. The remaining 40 samples included surface soils and waste samples from test pits and drummed waste spills.

Eight metals were identified as CoPCs in surface sediments within the undeveloped area. Seven were selected based on screening against toxicity values (arsenic, cadmium, chromium, mercury, thallium, vanadium, and zinc) and one (methylmercury) was included as a CoPC based on historical use.

Of the 24 organic compounds detected, seven compounds or mixtures exceeded their RBCs. These included five PAH compounds (i.e., benz[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and two polychlorinated biphenyl (PCB) Aroclors® (Aroclors® 1248 and 1260). These compounds or mixtures were identified as CoPCs (Tables 2.3 and 3.2 in Appendix A).

Of the 58 substances detected in surface soils and wastes, 24 exceeded the toxicity screening values. These include 15 metals (antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, methylmercury, nickel, silver, thallium, vanadium, and zinc). Nine organic compounds exceeded the screening toxicity values for residential soils. These included two noncarcinogenic PAHs (2-methynaphthalene and naphthalene) and five carcinogenic PAHs (benz[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene). These seven PAH compounds, plus bis[2-ethylhexyl]phthalate and Aroclor® 1248, were identified as CoPCs (Tables 2.4 and 3.2 in Appendix A).

3.1.3 Subsurface Soils in the Developed and Undeveloped Areas

Screening of subsurface soils was conducted for subsurface samples from the developed and undeveloped areas separately. Subsurface soil samples were taken from depths of 1–20 ft below ground surface (35 samples in the developed area and 104 in the undeveloped area were analyzed for mercury). Seven metals were identified as CoPCs in the developed area subsurface soils: arsenic, barium, chromium, copper, manganese, mercury, and thallium. One noncarcinogenic PAH (2-methylnaphthalene) plus two additional organic chemicals (benzene and Aroclor® 1260) were identified as CoPCs (Tables 2.5 and 3.3 in Appendix A).

Fifteen metals were identified as CoPCs in the undeveloped area through screening (antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) and one (methylmercury) was included as a CoPC based on historical use of mercury. Six carcinogenic PAHs (i.e., benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and three noncarcinogenic PAHs (i.e., 2-methylnaphthalene, benzo[ghi]perylene, and naphthalene) were identified as CoPCs. In addition, the following five organic chemicals were identified as CoPCs: PCBs (Aroclors® 1242, 1248, and 1254), carbazole, dibenzofuran, toluene, and xylene (Tables 2.6 and 3.4 in Appendix A).

Review of the data for 2-methylnaphthalene indicated that the subsurface soil in the developed area had only one reported result at a concentration of 11 mg/kg. This is because concentrations below the detection limit were not reported. In contrast, within the undeveloped area there were 44 samples, 12 of which had concentrations above the detection limit, with a maximum of 8.8 mg/kg. Given the uncertainty related to the application of a single data-point, the risk assessment applied the more complete analytical data for 2-methynaphthalene from the undeveloped area.

3.2 Surface Water

Chemicals in surface water were compared with EPA Region IX RBCs based on residential drinking water consumption (U.S. EPA 2005a). Screening of surface water in OU1 was conducted for all samples together. Surface water samples from five stations in the West Ditch and the onsite basin were evaluated. Three metals were identified as CoPCs in surface water: manganese, mercury, and methylmercury. Although the maximum concentration was below the screening level, methylmercury was included at the request of NJDEP. No organic chemicals were identified as CoPCs (Tables 2.7 and 3.5 in Appendix A).

3.3 Groundwater

Screening of groundwater in OU1 was conducted for all samples site-wide. Groundwater samples were collected from the 15 monitoring wells located in the developed and undeveloped filled areas. Ten metals were identified as CoPCs in groundwater: arsenic, barium, cadmium, copper, manganese, mercury, methylmercury, nickel, thallium, and vanadium. Methylmercury was included as requested by NJDEP. Two noncarcinogenic PAHs (i.e., 2-methylnaphthalene and naphthalene) were identified as CoPCs. Eight additional organic chemicals were identified as CoPCs: 1,4-dichlorobenzene, 4-methylphenol, 1,2-dichlorothene isomers, benzene, chlorobenzene, chloroethane, toluene, and xylene.

3.4 Air

Consistent with the work plan for the site and the primary importance of mercury as a site contaminant, mercury was the only site contaminant sampled in outdoor and indoor air. As requested by EPA and NJDEP, this assessment includes evaluation of estimated concentrations of volatile CoPCs in indoor air. In addition, estimated concentrations of chromium particulates (assumed to be chromium(VI)) were also evaluated in outdoor air.

For indoor air evaluations, two transport pathways were considered: 1) migration from soil or groundwater to indoor air, which was evaluated through application of the Johnson and Ettinger Model as recommended by U.S. EPA (2003a); and 2) volatilization of contaminants from drinking water to indoor air, which was evaluated in a hypothetical future residential drinking water scenario through application of the Andelman Model as modified by Schaum et al. (1994) and NJDEP (2003). The methodology used in these models is discussed further in Section 4.

Based on available sampling data, mercury vapor was identified as a CoPC in outdoor air (Tables 2.9 and 3.7 in Appendix A) and site screening described here also identified chromium particulates as a potential outdoor air CoPC. Air samples were collected during the Phase I field investigation, during the warehouse evaluation study, and by NJDEP. During the Phase I investigation, particulate mercury and total gaseous mercury were measured in five samples collected in September and October 1997, and total gaseous mercury was measured in six samples collected in March 1998. In the supplemental warehouse study, gaseous mercury was measured at three locations inside the U.S. Life (Jerbil) Warehouse and at two outside locations in April 1999. Both particulate and gaseous mercury were measured by NJDEP in 1989 and 1990. Six samples were taken at three locations within OU1, one of which was above the limit of detection. Given the uncertainty in the early data regarding sampling methods, and the availability of 16 samples from a recent investigation, the single detected sample from the NJDEP sampling was not included in this HHRA.

Inhalation of CoPCs in outdoor air is an additional potential exposure pathway. In order to evaluate the magnitude of this pathway, maximum soil concentrations of all CoPCs were compared with RBCs derived by EPA Region IX to be protective of inhalation exposures. Specifically, as described above, EPA Region IX calculates RBCs termed PRGs based on conservative assumptions about exposure through inhalation, dermal contact, and ingestion (U.S. EPA 2005a). EPA calculates soil concentrations that would be protective of particulates re-suspended from soil for each chemical that has a toxicity value for inhalation. Table 2.10 in Appendix A shows the relative influence of potential human exposure pathways, including inhalation of particulates from soil, on RBCs for residential soil.

The models used to calculate RBCs for inhalation of particulates from soil are from the EPA *Soil Screening Guidance: User's Guide and Technical Background Document* (U.S. EPA 1996a,b). EPA applies conservative assumptions regarding inhalation rates (i.e., 20 m^3 per day for an adult and 10 m^3 per day for a child) over 350 days per year and 30 years, and a particulate emissions factor derived in the EPA soil screening guidance. The EPA Region IX modeling for this pathway also applies conservative assumptions regarding the amount of emission and deposition of particles onto soil.

As shown in Appendix A, Table 2.10, the RBCs derived for outdoor inhalation of metals from soil are much higher than the maximum concentration of all of the metals identified in site soils except chromium (as chromium(VI)). The maximum chromium surface soil concentration was 8,230 mg/kg and the maximum subsurface soil concentration for chromium was 9,840 mg/kg. Because these concentrations are greater than the screening value (30 mg/kg), chromium was evaluated in the inhalation pathway through application of the particulate emissions factor identified in U.S. EPA (2005a) to the maximum soil concentration for chromium to derive an estimate for chromium particulates in air.

Two semivolatile or volatile chemicals (benzene and naphthalene) had site concentrations close to the inhalation RBCs. These chemicals were evaluated in the indoor air modeling to provide a more conservative estimate of risk resulting from the potential for buildup of contaminants in indoor air assumed in the model.

4 Exposure Assessment

Exposure assessment is the process of identifying human populations that could potentially contact site-related chemicals and estimating the magnitude, frequency, duration, and route(s) of potential exposures. In this HHRA, potential OU1 risks were evaluated in hypothetical current and future workplace scenarios, and in a future trespasser exposure scenario. In addition, potential exposure to subsurface soil was considered for a construction worker. A residential population was not considered here, given the nature of the area (i.e., limited zoning and access), which makes future residential development unlikely. However, consistent with the State of New Jersey designation of the aquifer as potable, groundwater CoPCs were evaluated in a future hypothetical residential drinking water scenario. This section describes how these scenarios were selected as a means of estimating current and hypothetical future exposures and potential risks. First, the exposure setting was characterized, and potentially exposed populations were identified (i.e., trespassers, workers, and hypothetical future residential users of drinking water). Next, potential exposure pathways were identified, and the methods and assumptions for quantifying exposure were presented.

4.1 Exposure Setting and Receptor Populations

Given the OU1 characteristics, current use, and zoning regarding future use, the most likely potential human receptors include onsite workers and trespassers who might visit OU1. Onsite workers are likely to be the receptor population with the highest exposure potential. In addition, because the aquifer is defined by the State of New Jersey as potable, use of groundwater as drinking water is evaluated in a future hypothetical residential scenario in order to evaluate the highest possible future use of groundwater. Although offsite residents could potentially inhale fugitive dust generated from OU1 media, the magnitude of exposure via this pathway would be less than for onsite workers, and thus this pathway is evaluated qualitatively through consideration of the inhalation pathway for onsite workers.

CoPCs have been detected in OU1 soil and groundwater, and in sediments and surface water within OU1. The current potential for exposure to media at OU1 is likely reduced because the developed area is largely covered by buildings and pavement. In addition, the undeveloped area is fenced on the north and west sides, and partially on the east side to prevent access from the tide gate. A portion of the east side (i.e., the side that borders Berry's Creek) and the south side (i.e., the side that borders the Diamond Shamrock/Henkel Ditch [north]) are not fenced. In order to evaluate potential future increases in access, the potential for receptors to contact CoPCs in each of the media was evaluated for future worker and trespasser scenarios, assuming no restrictions on access.

4.2 Potential Exposure Pathways

This section identifies potential exposure pathways for CoPCs found in environmental media. An exposure pathway is the course a chemical takes from a source to an exposed receptor.

Exposure pathways consist of the following four elements: 1) a source; 2) a mechanism of release, retention, or transport of a chemical in a given medium (e.g., air, water, soil); 3) a point of human contact with the medium (i.e., exposure point); and 4) a route of exposure at the point of contact (e.g., incidental ingestion, dermal contact). If any of these elements is missing, the pathway is considered incomplete (i.e., it does not present a means of exposure). Only those exposure pathways judged to be potentially complete are quantified in the HHRA. Appendix A Table 1 summarizes the exposure pathways evaluated in the HHRA and is consistent with Table 1 of U.S. EPA (1998).

At least one CoPC has been detected in each of the media evaluated—surface soil, subsurface soil, surface water, groundwater, and air. As described above, the most likely means for human exposure to these CoPCs is through workplace use of, or trespassing on, these areas. Opportunities for exposure to CoPCs are low at the present time because of the limited access to any site area and to surface soil within the developed area. However, in the baseline HHRA, exposure scenarios were developed assuming no limitations on site access.

4.3 Quantification of Exposure

In this section, CoPC intakes for chronic exposures are estimated for the exposure pathways identified in the previous section. CoPC intakes are based on estimates of exposure concentrations at the exposure point (i.e., EPCs) and on the estimated magnitude of exposure to CoPC-containing media. Exposure estimates for chronic daily intakes (CDIs) are defined as the mass of a CoPC taken into the body, per unit of body weight, per unit of time. For dermal contact, exposures are expressed as absorbed dose rather than administered dose.

The averaging time used to determine a CDI depends on the type of toxic effect being assessed. For carcinogenic effects, CDIs are calculated by averaging the total cumulative dose over a lifetime. The estimate of the average lifespan is assumed to be 70 years, based on EPA guidance (U.S. EPA 1991).[2] For assessing noncancer effects, CDIs are calculated by averaging intakes only over the period of exposure. The distinction between these two approaches is based on EPA's currently held opinion that the toxicological mechanisms of action are different for carcinogenic and noncarcinogenic processes.

Intakes of CoPCs were estimated using algorithms and assumptions consistent with EPA guidance (e.g., U.S. EPA 1989) for the following potential exposure pathways:

- **Surface soils in the developed area—**Incidental ingestion, and dermal contact with CoPCs by long-term workers and construction workers
- **Surface soils in the undeveloped area—**Incidental ingestion, dermal contact with CoPCs by long-term workers, construction workers, and trespassers who might visit OU1

[2] EPA's most recent edition of the *Exposure Factors Handbook* (U.S. EPA 1997a) recommends use of 75 years for the average value for life expectancy; however, the original 70-year value is used in this risk assessment for consistency among risk assessments, and because some of the CSFs and unit risks (see Section 5) are derived based on a 70-year lifetime, and the difference (error) between the two values is low.

- **Subsurface soils in the developed and undeveloped areas**—Ingestion and dermal contact with CoPCs in subsurface soils by construction workers
- **Surface water and sediments in OU1—**Incidental ingestion and dermal contact with surface water and sediment by an adult or older child trespasser who might contact CoPCs in the onsite basin and the West Ditch
- **Groundwater—**Ingestion and dermal contact of CoPCs in groundwater are evaluated in hypothetical OU1-wide future long-term worker and resident scenarios
- **Outdoor air—**Inhalation of mercury vapor and chromium particulates in outdoor air by long-term workers in the developed or undeveloped area
- **Indoor air CoPCs migrating from subsurface soil or groundwater—** Inhalation of volatile contaminants in indoor air by long-term workers in the developed or undeveloped area
- **Indoor air CoPCs migrating from domestic groundwater—**Inhalation of volatile contaminants in indoor air during and after showering or bathing by residents who use groundwater for domestic drinking water.

Both reasonable maximum exposure (RME) and central tendency estimates were calculated. EPA describes RME as the highest exposure that is reasonably expected to occur at a site (U.S. EPA 1989). EPA, in the *Final Guidelines for Exposure Assessment*, defines typical (or central tendency) exposures as follows:

> The average [exposure or dose] estimate, used to describe the arithmetic mean, can be approximated by using average values for all the factors making up the exposure or dose equation (57 Fed. Reg. 104:22888).

The following subsection presents the exposure algorithms and assumptions used to calculate CDIs for each of the exposure pathways listed above, and the methods used to calculate EPCs for the RME and central tendency cases.

4.3.1 Exposure Frequency and Duration and Receptor Characteristics

As described above, the most likely human populations to use the area are workers, although trespassers could also visit OU1. Worker scenarios considering exposure to surface and subsurface soil and to outdoor air were evaluated for the developed and undeveloped areas. In the developed area, current and future worker scenarios were evaluated to consider current exposure to unpaved soil and future exposure to all soil (i.e., including soil now under pavement). A future long-term worker scenario was also evaluated for the undeveloped area. While future development as a workplace would likely require some modifications to the undeveloped area soil, this hypothetical future scenario was evaluated under baseline conditions to determine whether site controls would be needed. The exposure frequency was 250 days for the long-term worker in the RME, and 219 days were assumed in the central tendency scenarios,

as identified by EPA (U.S. EPA 2004). The exposure duration for the worker is 25 years for the RME scenario, as identified by EPA (U.S. EPA 1991). For the central tendency scenario, a 9-year duration is applied. This value was identified as the median amount of time that workers spend in one occupation (U.S. EPA 2004).

A construction worker scenario was also evaluated to consider hypothetical current or future contact with surface and subsurface soils in the developed and undeveloped areas. Consistent with the request from NJDEP (2001), the construction worker scenarios assumed that workers contact soils for three months per year (i.e., 60 days/year) in the RME, or 25 days/year in the central tendency scenario, over a 2-year construction period. The worker's body weight was assumed to be 70 kg (U.S. EPA 2004).

A trespasser scenario was considered for the undeveloped area. The developed area has more limited access, and any risk for a trespasser who might gain access would be less than that estimated for a long-term worker. For the undeveloped area, the most likely trespassers are adults and older children (i.e., 9–18 years old). Younger children would not be expected to trespass within the area, given the limited access. In this assessment, trespassers were assumed to be exposed either to soils or sediment and surface water on a given visit. Trespassing within the undeveloped area is unlikely, and any occurrence is expected to be infrequent because of limited access, surrounding industrial development, and cold winter and fall weather. For an RME value, consistent with the request of NJDEP (2001), this assessment assumed 130 visits per year. This was derived by NJDEP assuming a trespasser visits approximately 4 days per week during the 13 summer weeks, and three days per week during the 26 spring and fall weeks. The central tendency scenario assumed approximately half as many visits (i.e., 65 visits per year [NJDEP 2001]).

Older children are assumed to visit OU1 areas as frequently as adults, but they have a somewhat higher exposure due to their lower body weight (i.e., 49-kg average for ages 9–18, in comparison to 70-kg average for adults). For the RME case, the HHRA assumed that adults might trespass within the area over a period of 30 years and older children might visit the area for nine years, while the central tendency exposure scenario assumed that both adults and older children might visit the West Ditch or onsite basin for a period of 9 years.

Because site groundwater is classified by the State of New Jersey as potable, a hypothetical future residential drinking water scenario is also evaluated (NJDEP 2001). In this scenario, it is assumed that water is consumed in the home 350 days per year for 30 years. Consistent with Schaum et al. (1994), the exposure duration assumed for adults was 30 years in the RME scenario and 9 years in the central tendency scenario. For children, the exposure duration was assumed to be 6 years in both estimates. The adult body weight in this scenario is assumed to be 70 kg and the child's body weight is assumed to be 15 kg (U.S. EPA 1991, 1997a, 2004).

4.3.2 Incidental Ingestion of Soils and Sediments

People visiting or working within OU1 may ingest surface soils or sediment as a result of direct contact with soil or sediment on the hands, followed by hand-to-mouth activity (either inadvertent or associated with eating or smoking). Surface soils in the undeveloped and developed areas, and sediments in the undeveloped area, were considered separately because of

the differences in current and future use. As described above, sediment samples were collected in OU1 (West Ditch and the onsite basin). Appendix A Tables 4.1 and 4.2 provide exposure assumptions for trespassers' exposure to soil and sediment while Tables 4.3 and 4.4 provide exposure assumptions for long-term workers' exposure to surface soil and construction workers' exposure to subsurface soil, respectively.

Incidental ingestion of soil and sediment was evaluated using EPA guidance for risk assessment regarding soil ingestion. U.S. EPA (1997a) does not provide an upper-bound value for adults and older children. However, U.S. EPA (1991) has identified 100 mg/day as an upper-bound intake rate for adults. Therefore, this value was used as the intake rate for older children and adults in the RME trespasser scenario. The current workers at the site are engaged in indoor activities in the warehouse and this use is anticipated to continue in the future. For the RME long-term worker scenario, the assumption is made that half of this intake occurs at work, consistent with primarily indoor work activities, resulting in an RME intake for workers of 50 mg/day (U.S. EPA 1991). Although the current site use is anticipated to continue in the future, the *Uncertainty Assessment* of this report includes evaluation of a scenario applying an assumed 100 mg/day ingestion rate, which would be representative of an outdoor worker scenario. Consistent with EPA guidance, the mean value for adults of 50 mg/day was used in the central tendency trespasser scenario for adults and older children, and in the central tendency scenario for long-term workers (U.S. EPA 1997a). For the construction worker, the ingestion rate of 330 mg/day identified in the EPA *Draft Soil Screening Guidance* was applied as required by EPA (NJDEP 2003) in the RME case and an ingestion rate of 50 mg/day was applied in the central tendency scenarios.

4.3.3 Dermal Contact with Soils and OU1 Sediments

Appendix A Tables 4.1 through 4.4 present the exposure algorithms and all exposure assumptions used in deriving exposure estimates for dermal contact with soils and OU1 sediments. Dermal exposure was expressed as an absorbed dose by incorporating a chemical-specific dermal absorption factor into the exposure equation. Dermal absorption factors reflect the desorption of the chemical from soil and the absorption of the chemical across the skin and into the bloodstream (U.S. EPA 1997a). Dermal absorption factors are those identified by NJDEP and EPA (NJDEP 2001). Consistent with guidance from NJDEP and EPA (NJDEP 2001), where data for absorption from soil are not available, dermal exposure is evaluated qualitatively.

Surface area reflects the amount of skin exposed to a chemical in the exposure scenario. EPA does not provide surface area estimates for use in evaluating recreational scenarios. For contact with outdoor soil exposure in a residential setting, however, U.S. EPA (2004) recommends using 5,700 cm^2 for an adult in both central-tendency and upper-bound estimates. This value represents the 50th percentile of surface areas of the head, hands, forearms, and lower legs and was derived from the average of these contact areas for men and women over the age of 18. This estimate was used for adult trespassers in contact with soil or sediment.

For evaluating the older child's dermal contact with soil or sediment, a surface area of 4,000 cm^2 was derived for both central tendency and RME estimates, based on guidance from

EPA and NJDEP (NJDEP 2001). Workers' dermal contact with soil was evaluated using the skin surface area recommended by U.S. EPA (2004) for workers, which is 3,300 cm^2. This is representative of the 50th percentile skin surface area for the head, hands, and forearms of males and females more than 18 years old. This surface area estimate was applied in the central tendency and RME scenarios of both the long-term worker and the construction worker.

The soil-to-skin adherence factor refers to the amount of soil that remains deposited on the skin after contact. Adherence factors vary by soil type (e.g., moisture content, particle size), by the body part contacting the soil, and by the activity being conducted while in contact with the soil. Adherence values identified in EPA's latest dermal guidance (U.S. EPA 2004) and as recommended by U.S. EPA (2005c) were applied. For the trespasser scenario, RME and central tendency adherence factors for adults were assumed to be 0.3 mg/cm^2 and 0.01 mg/cm^2, respectively. For older children, RME and central tendency adherence factors were applied, including 0.3 mg/cm^2 (U.S. EPA 2005c) for the RME scenario and 0.04 mg/cm^2 (U.S.EPA 2004) for the central tendency scenario. The 0.3 mg/cm^2 adherence factor was recommended by U.S. EPA (2005c) as more representative of exposure to sediments, which may adhere more readily to the skin. This value was applied here for both soil and sediments. For the construction worker scenario, the adherence factors of 0.2 mg/cm^2 for the RME scenario and 0.1 mg/cm^2 for the central tendency scenario were used in calculations, as recommended by NJDEP. The adherence factor of 0.2 mg/cm^2 is the highest 50th percentile factor, identified in data from utility workers. For the long-term worker, an adherence value of 0.2 mg/cm^2 was applied in the RME scenario and 0.02 mg/cm^2 was applied in the central tendency case, consistent with recommendations by NJDEP and EPA (NJDEP 2001).

4.3.4 Incidental Ingestion of Surface Water

Appendix A Tables 4.5 and 4.6 present the exposure algorithms for incidental ingestion of surface water while wading in the West Ditch or trespassing near the onsite basin. As described above, given the OU1 location, any trespassing in these areas would be expected to be minimal. For the trespasser scenario, wading was assumed to represent the greatest exposure potential, because the OU1 surface water features are an unlikely location for trespassing and are too shallow for swimming. RAGS (U.S. EPA 1989) recommends a value of 50 mL/hour as the amount of water ingested while swimming. Based on professional judgment, the HHRA assumed that 25 percent of EPA's assumed water consumption rate for swimming, or 12 mL/hour, will be consumed while trespassing near the West Ditch or onsite basin. For the RME and central tendency scenarios, it was assumed that wading occurs 1 hour/day and 0.5 hour/day, respectively, based on best professional judgment. Trespasser receptors, exposure duration, and exposure frequency are the same as noted above.

4.3.5 Dermal Contact with Surface Water

Appendix A Tables 4.5 and 4.6 also present the algorithms for calculating the absorbed dose from dermal contact with surface water in OU1. The exposure assumptions for dermal contact with water are the same as those described for dermal contact with soil. Specifically, trespassers (older children or adults) visiting these areas are assumed to submerge the surface areas of their hands, forearms, feet, and lower legs.

The permeability constant reflects the rate of movement of the chemical across the skin. Permeability constants for all the CoPCs in surface water were taken from comments provided by NJDEP (NJDEP 2001) or from U.S. EPA (2004) (i.e., from Table 3.1 for metals, or Appendix B for organic CoPCs) and are shown in Appendix A, Table 4.7. All other exposure assumptions are the same as discussed above for ingestion of surface water.

4.3.6 Ingestion of and Dermal Contact with Groundwater for Workers

Appendix A Table 4.8 presents algorithms that were used to calculate exposure to CoPCs via use of OU1 groundwater as drinking water in a long-term worker scenario. As described previously, such use is highly unlikely and is considered here for risk assessment purposes only. The intake of groundwater for the RME was assumed to be 1 L/day, based on the 2-L/day total intake of drinking water identified by U.S. EPA (1997a). This assumes that half of all water intake is consumed in the workplace. Similarly, the central tendency case assumed an intake of 0.7 L/day based on half of the 1.4-L/day mean value identified by U.S. EPA (1997a). Dermal contact with drinking water at the workplace is assumed to be limited to washing hands. The surface area assumed was derived from Table 6-4 of U.S. EPA (1997a) and represents the average of the mean values (i.e., 793 cm^2, derived from 840 cm^2 and 746 cm^2). Because hand washing involves a very brief exposure period, a fractional intake for dermal exposure to water of 0.03 was applied to represent about 2 minutes of exposure per day, (i.e., 30 seconds per hand washing and four exposures per day). Exposure frequency and duration assumptions are those identified previously for long-term workers.

4.3.7 Use of Groundwater as Drinking Water for Hypothetical Future Residents

As described above, because the site groundwater is identified by the State of New Jersey as potable drinking water, site CoPCs were evaluated in a future hypothetical scenario in which water is used as domestic drinking water. In this scenario, water was used for drinking, bathing, and all other household uses. Associated pathways include:

- Consumption of drinking water by adults and children
- Dermal contact with CoPCs during bathing and showering
- Inhalation of volatile CoPCs during bathing or showering.

Exposure assumptions used in this assessment are those agreed to in conversations with EPA Region II and are consistent with U.S. EPA (1991, 1997a). In all pathways, a standard default exposure frequency of 350 days per year and duration of 30 years was applied for adults and 6 years for children.

4.3.7.1 Hypothetical Future Residential Consumption of Drinking Water

The algorithms and assumptions for ingestion and dermal contact with drinking water for adults and children are presented in Appendix A Tables 4.9 and 4.10, respectively. For adults, the

assumed RME drinking water ingestion rate of 2 L/day is based on guidance in U.S. EPA (1991) and the central tendency estimate is 1.4 L/day, which is the mean for adults identified in U.S. EPA (1997a, Table 3-30). For children, the RME ingestion rate of 1.5 L/day is the 95th percentile rate for children ages 3 to 5. This value also represents the 95th percentile rate for children less than three years old. The childhood assumed central tendency ingestion rate of 0.74 L/day is a mean from U.S. EPA (1997a, Table 3-30) and represents the average of mean intakes of children less than 3 years and children 3 to 5 years.

4.3.7.2 Dermal Contact with Water During Showering or Bathing

The algorithms and assumptions for dermal contact with domestic water for adults and children during showering or bathing are presented in Tables 4.9 and 4.10 of Appendix A. Exposure terms unique to this hypothetical residential pathway include skin surface area and showering or bathing time. For adults, the assumed RME and central tendency skin surface area was 18,000 cm^2, which represents the average of the male and female average surface area identified in U.S. EPA (1997a, 2004). The RME and central tendency surface area for children of 6,600 cm^2 is based on the recommendation for estimates of a bathing or showering scenario provided in U.S. EPA (2004).

Exposure times for contact with water during showering or bathing were derived from U.S. EPA (2004). These assumptions include: estimates of 0.58 hours in the RME and 0.25 hours in the central tendency scenario for adults and 1.0 hour in the RME and 0.33 hours in the central tendency for a child. One bath or shower per day was assumed.

4.3.7.3 Inhalation of Volatile CoPCs During Bathing or Showering

Consistent with a request from EPA and NJDEP (NJDEP 2001), hypothetical concentrations of CoPCs in indoor air were estimated through application of the Andelman model as modified by Schaum et al. (1994). This model was run to evaluate the concentration of volatile contaminants that might be present in indoor air during and after showering, and to estimate risks for adults and children following exposure to indoor air related to bathing or showering. Appendix C, Tables C-1 through C-7 show the methodology, the exposure assumptions, and the results of the runs of the Andelman model. EPCs for groundwater were the site-specific inputs for the model estimates.

Appendix C Tables C-1 through C-3 show the algorithm and the assumptions used in estimating air concentrations and risks in the Andelman model. Two exposure assumptions unique to this pathway were the inhalation rate during showering and the time spent in the shower and in the bathroom. The inhalation rate assumed was 20 m^3 per day for adults and children (i.e., 0.83 m^3 per hour) based on the assumptions in the Andelman model and consistent with assumptions used by EPA in deriving unit risk values for application in risk assessment. The exposure time spent in the bathroom during and after bathing or showering was based on recommendations from EPA Region II (U.S. EPA 2003b) and was also based on the Andelman model. These assumptions include: RME estimates of 0.58 hours for adults (i.e., the time in the shower [t_1] of 0.25 hours and the time after showering [t_2] of 0.33 hours) and 1 hour for a child (i.e., [t_1] of 0.45 hours and [t_2] of 0.55 hours); and central tendency estimates of 0.25 hours (i.e., [t_1] of

0.10 hours and [t_2] of 0.15 hours) for an adult at 0.33 hours for a child (i.e., [t_1] of 0.14 hours and [t_2] of 0.19 hours). One bath or shower per day was assumed.

4.3.8 Inhalation of Mercury Vapors and Chromium Particulates in Outdoor Air

Consistent with the work plan, mercury vapor was the only chemical measured in outdoor air. The maximum mercury vapor concentrations exceeded the PRG, and it was identified as a CoPC. In addition, as described above, chromium concentrations in soil exceeded the screening value for inhalation of particulates from soil, and thus chromium was identified as a CoPC for outdoor air. Appendix A Table 4.11 presents the algorithm used to calculate exposure to the measured concentrations of mercury vapor and estimated concentrations of chromium particulates in outdoor air. Exposure assumptions include an inhalation rate of 3.3 m^3/hr for the RME, which is the recommended upper-percentile rate for outdoor workers, and an inhalation rate of 1.3 m^3/hr for the central tendency case, which is the mean value identified by U.S. EPA (1997a). The time spent outdoors for both the RME and central tendency cases was assumed to be an average of 2 hours per day over the course of the year, based on best professional judgment. Exposure frequency and duration are the same as those identified for the long-term worker.

4.3.9 Inhalation of CoPCs that Migrate from Soil or Groundwater to Indoor Air

Consistent with the work plan, the remedial investigation air sampling was for mercury only because mercury was a primary concern at the site. However, comments on the draft HHRA (NJDEP 2001) indicated the need for further evaluation of the vapor intrusion pathway for additional CoPCs identified in soil or groundwater. Vapor intrusion is the migration of volatile chemicals from subsurface soil and groundwater into overlying buildings. In agreement with EPA and NJDEP, the potential for exposure to volatile CoPCs in indoor air was evaluated using the latest version (031403) of the Johnson and Ettinger model software developed by U.S. EPA (2003a). The model methodology and assumptions are briefly described here and are summarized in Appendix C Tables C-8 and C-9. The modeling results are provided in Appendix C Tables C-10 and C-11.

The Johnson and Ettinger model generally provides a conservative means to evaluate potential risks related to exposure to chemicals in indoor air. Some of the key modeling input parameters, such as the building air exchange rate (ER), average soil gas flow rate into the building (Q_{soil}), and the building mixing height (H_B), are determined based on the EPA *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (U.S. EPA 2002b). However, there are uncertainties related to the application of the Johnson and Ettinger model at this site, which are described in Section 6.3.3. For example, the model assumes a homogeneous substrate, which may not reflect actual conditions. Despite these uncertainties, the model was identified by EPA and NJDEP as the best available way to evaluate potential future indoor air concentrations in the absence of building and indoor air concentration data.

4.3.9.1 Johnson and Ettinger Methodology

The Johnson and Ettinger model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces. The model provides an estimated attenuation coefficient that relates the vapor concentration in the indoor spaces to the vapor concentration at the source of contamination (e.g., subsurface soil, groundwater). The model is constructed as both a steady-state solution to vapor transport (infinite or non-diminishing source) and as a quasi-steady-state solution (finite or diminishing source). Input parameters to the model include chemical and physical properties of the modeled chemicals, saturated and unsaturated zone soil properties, and structural properties of the buildings.

Three scenarios were considered to evaluate the potential vapor intrusion pathway for future hypothetical workplaces in the developed area or in the undeveloped area including:

- Vapor intrusion from subsurface soil to indoor air was modeled at the developed area (because the average depth to groundwater was 2.7 ft, the modeling was conducted assuming a building with no basement)
- Vapor intrusion from subsurface soil to indoor air was modeled at the undeveloped area (because the average depth to groundwater was 7.7 ft, the modeling was conducted assuming a building with basement)
- Vapor intrusion from groundwater to indoor air in either area based on site-wide groundwater concentrations. Modeling was conducted assuming buildings had basements. Although the assumption of a basement within the developed area likely overestimated risks for that area, as indicated in Section 6, risk estimates for this pathway were well below thresholds typically considered to be of concern.

Input concentrations for soil and groundwater were the EPCs for subsurface soils in the developed area and undeveloped area, and the EPCs for sitewide groundwater.

4.3.9.2 Johnson and Ettinger Input Parameter Determinations

To achieve more realistic transport and fate modeling results, efforts have been made to develop site-specific parameters as part of the inputs to the Johnson and Ettinger model. These parameters include average sampling depth for subsurface soil samples and depth to groundwater tables. For the rest of the input parameters, the default values recommended by the Johnson and Ettinger model User's Guide (U.S. EPA 2003a) were used.

Following EPA Region II's recommendation, the key input parameters for the vapor intrusion modeling were selected from Appendix G of the *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (U.S. EPA 2002b), and are summarized as follows:

- Building air exchange rate (ER): 0.25 L/hour
- Building area and subsurface foundation area (L_B and W_B): 10×10 m

- Building mixing height (H_B): 3.66 m for basement; 2.44 m for slab-on-grade
- Average soil vapor flow rate into the building (Q_{soil}): 5 L/min
- Floor-wall seam crack width (w): 0.1 cm.

4.3.9.3 Modeling Results

The indoor air concentrations of chemicals of concern for each of the scenarios were modeled using the latest version of EPA's Johnson and Ettinger model software, and the results for subsurface soil to indoor air and for groundwater to indoor air are summarized in Appendix C Tables C-10 and C-11, respectively. These modeling results were used in hypothetical risk estimates for workers exposed to CoPCs in indoor air.

4.3.9.4 Indoor Air Exposure Assumptions

The algorithm and exposure assumptions for estimating workers' inhalation of CoPCs in indoor air are presented in Appendix A, Table 4.12. The assumptions regarding exposure frequency and exposure duration are consistent with those for other worker exposure pathways as described above (i.e., 250 days per year for 25 years in the RME and 219 days per year for 9 years in the central tendency scenario). EPA has not published inhalation rates for indoor workers; however, U.S. EPA (2005c) recommended application of an inhalation rate of 20 m^3 per work-day, which has been applied here. This inhalation rate is based on an 8-hour day at 2.5 m^3/hour and is presented in Exhibit 4-1 of the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (OSWER 9355.4-24). The inhalation rate in the central tendency scenario was calculated using a rate of 1.0 m^3/hour for 9 hours (U.S. EPA 1997a).

4.3.10 Evaluations for Lead

Exposure to lead in soil was evaluated through application of the ALM in agreement with U.S. EPA (1996c). The ALM is recommended for adults and older children, and was applied here to evaluate lead uptake. The EPA ALM was developed based on Bowers et al. (1994) with some modifications to input assumptions, which generally makes the model more conservative (i.e., the modifications result in higher predicted blood lead levels associated with a given soil concentration). Although EPA indicates that this model has not been fully peer-reviewed or rigorously validated, EPA recommends it for assessing exposure of older age groups (adolescents to adults) to lead in soil. The model was used to evaluate lead exposure to the most sensitive subpopulation: the fetuses of pregnant women who work at the site or who visit the site.

The ALM estimates an average blood lead level based on additional exposure (above a baseline level) to lead in soil and air. The model applies a biokinetic slope factor to exposure estimates in order to derive an estimate of blood lead concentrations related to exposure levels. Ingestion exposure is the primary pathway evaluated in the model. The equation is as follows:

$$PbB_{central,\,adult} = PbB_0 + \frac{BKSF \times C_s \times IR_s \times EF_s \times AF_s \times FI_s}{AT}$$

where:

$PbB_{central,\,adult}$	=	geometric mean blood lead level for adults, central estimate (μg/dL)		
PbB_0	=	maternal baseline blood lead level (μg/dL)	=	1.98
BKSF	=	biokinetic slope factor (μg/dL per μg/day)	=	0.4
C_s	=	lead concentration in soil (μg /g-dry weight)	=	area specific
IR_s	=	soil ingestion rate (g/day)	=	0.050
EF_s	=	exposure frequency (days/year)	=	219 long-term worker, 25 construction worker, 65 visitor
AF_s	=	absorption fraction (unitless)	=	0.12
FI_s	=	fractional intake of soil from site (unitless)	=	1.0
AT	=	averaging time (days/year)	=	365.

To predict a central tendency (geometric mean) blood lead level, all inputs should be central tendency (i.e., average) estimates, not reasonable maximums (U.S. EPA 1996c). To calculate the 95th percentile blood lead level, a geometric standard deviation (GSD) representing variability of blood lead in the population is applied:

$$PbB_{95,\,adult} = PbB_{central} \times GSD^{1.645}$$

where:

$PbB_{95,\,adult}$	=	95th percentile estimate of blood lead level for adults (μg/dL)
GSD	=	population geometric standard deviation (unitless) = 2.0
1.645	=	95th percentile value for Student's t distribution.

Fetal blood lead levels are predicted on the basis of the EPA assumption that fetal blood lead levels at birth are 90 percent of the maternal blood lead level. Thus, the 95th percentile estimate fetal blood lead level is estimated as follows:

$$PbB_{95,\,fetal} = PbB_{95,\,adult} \times R$$

where:

$PbB_{95,\,fetal}$	=	95th percentile estimate of blood lead level for fetus (μg/dL)		
R	=	fetal-to-maternal constant of proportionality	=	0.9 (unitless).

Site-specific modifications to the EPA default assumptions (U.S. EPA 1996c) are described below.

4.3.10.1 Baseline Blood Lead Level and Geometric Standard Deviation

U.S. EPA (2002a) contains data on baseline blood lead for different regions and ethnic groups; it also reports updated values for baseline blood lead in U.S. females from 17 to 45 years of age. The mean baseline blood lead of 1.98 μg/dL reported by U.S. EPA (2002a) for all ethnic groups within the Northeast region of the U.S. was used as input for the ALM in the risk assessment.

The GSD is an estimation of variation in blood lead around the geometric mean, and is used to estimate upper percentile blood lead levels for an hypothetical individual and predict the probability of an individual exceeding a given blood lead level (target risk goal). The GSD on blood lead of 2.0 μg/dL reported by U.S. EPA (2002a) for all ethnic groups within the Northeast region of the U.S. was used as input for the ALM in the risk assessment.

4.3.10.2 Soil Ingestion Rates

The soil ingestion rates for the ALM are all consistent with the central tendency ingestion rates applied in the risk estimates for other site CoPCs. Inputs to the ALM should be central tendency estimates, rather than upper end estimates. Accordingly, U.S. EPA (1996c) recommends a default soil ingestion rate of 50 mg/day for use in the model and this has been applied in risk estimates for lead.

4.3.10.3 Exposure Frequency to Soil

EPA recommends an exposure frequency for workers of 219 days per year for the ALM (U.S. EPA 1996c) and this has been applied in estimates for workers. Estimates for construction workers and for trespassers were based on the central tendency estimates of 25 days and 65 days, respectively.

4.3.10.4 Gastrointestinal Absorption Fraction of Lead from Soil and Fractional Intake

The ALM default for soil lead bioavailability of 12 percent was applied here in the absence of any site-specific information on absorption of lead from soil (U.S. EPA 1996c).

The fractional intake of soil (FI_s) from the site used in the risk assessment for the ALM was 1.0, assuming 100 percent of soil ingestion occurs at the site, consistent with the assumption in all risk estimates except those evaluating EPCs including hot spot concentrations for mercury.

4.3.11 Exposure Point Concentrations

The EPC, or the concentration term in the exposure equation, is derived to reflect a representative concentration at the exposure point or points over the exposure period (U.S. EPA 1989). In evaluating the RME exposure scenario, EPA guidance specifies the use of the 95 percent upper confidence limit (UCL) on the mean concentration. Consistent with guidance

from EPA Region II, the UCL was applied in both the RME and in the central tendency scenarios. Where the UCL was greater than the maximum value, the maximum concentration was applied. Where a chemical was detected at least once in a data set, the remaining undetected samples were included in the UCL calculations using one-half of the detection limits for undetected samples. UCL calculations were conducted using EPA's ProUCL 3.0 software, in accordance with U.S. EPA (2002a).

Unlike risk estimates for CoPCs other than lead, the lead model requires central tendency inputs including a mean concentration. Therefore, for the lead model, the mean concentration was applied per model guidance (U.S. EPA 1996c).

To evaluate exposures to CoPCs in OU1 media, concentrations in developed and undeveloped areas and within the OU1 soils, sediments, and surface water were each calculated separately to better represent likely future uses of these areas. Moreover, as described previously, exposure to developed area soils was assessed separately for the current and the future scenarios, to reflect current exposure to unpaved soil and future exposure to all surface soil, including soils now under pavement.

As part of data analyses conducted during the HHRA, data in each affected environmental medium were evaluated. For data sets with fewer than ten sample results, the maximum concentration was used as the EPC for both the RME and central tendency case. Where data sets were larger than or equal to ten sample results, the data distributions were statistically tested against normal, gamma, and lognormal distributions. In cases where a normal distribution fit the data, the 95 percent UCL was calculated using the Student's t-statistic method. Where a gamma distribution fit the data, a 95 percent UCL was calculated using either the approximate or adjusted gamma method.

In cases where a lognormal distribution fit the data, a 95 percent UCL was calculated using Land's H-statistic method or Chebyshev inequality (minimum variance unbiased estimate) method, dependent on the sample size and standard deviation of the log-transformed data. For small sample sizes with large log-transformed standard deviations, a higher percent (97.5 or 99 percent) UCL using Chebyshev inequality was used to provide adequate coverage of the mean. When none of the tested distributions fit the data, a non-parametric UCL method was used. ProUCL provides seven non-parametric UCL methods. The UCL used in the exposure assessment was calculated using the method recommended by ProUCL, in accordance with U.S. EPA (2002a). Results of the calculation of the EPCs used in the HHRA are presented in Appendix A Tables 3.1 through 3.13; Appendix E provides the ProUCL output for all data sets.

As recommended in *Supplemental Guidance to RAGS: Calculating the Concentration Term* (OSWER Publication 9285.7-081, 1992), the concentration term

> ...is an estimate of the arithmetic average concentration for a contaminant based on a set of site sampling results. Because of the uncertainty associated with estimating a true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable. The 95 percent UCL provides reasonable confidence that the true site average will not be underestimated.

Appendix A includes summaries of OU1 data and EPCs.

4.3.12 Evaluation of Outliers for Mercury and Lead in Soil

Two sample locations were identified with mercury concentrations much higher than remaining values: SS-04 in the developed area and HS-5 in the undeveloped area; these were identified as hot spots and evaluated as such within the risk assessment. In addition, the lead concentration at HS-5 was also identified as an outlier (Table 4.1). These determinations were made by both statistical evaluation and by visual inspection of the sample results for lead and mercury in site soils. Figures 4-1 through 4-4 show the geographic distribution of mercury and lead concentrations in site soils.

The maximum mercury value in the developed area (all soils) was 13,800 mg/kg, which is much higher than the next highest concentration (2,250 mg/kg). UCLs were calculated including and excluding this value. The resulting UCLs were 3,861 mg/kg and 1,312 mg/kg; both were applied in risk calculations in the HHRA. In addition, in the undeveloped area, Sample HS-5, a hazardous waste sample, had a concentration of 295,000 mg/kg and was also identified as an outlier. Calculations were conducted including and excluding this value. The UCL including the outlier was 80,838 mg/kg and recalculation of the UCL without this value resulted in an EPC of 181 mg/kg. Both of these UCLs were used in risk estimates for surface soil in the undeveloped area.

Risk calculations including the outlier values are identified as such. Because the outlier values have a large influence on the resulting UCL, but do not represent a substantial proportion of the site area, a fractional intake of 0.1 was applied in RME risk calculations for the outlier analyses of mercury in agreement with EPA. In order to evaluate the uncertainty around this fractional intake value, the central tendency calculations were conducted using a fractional intake of 0.05. In addition, the uncertainty assessment includes an evaluation of hazards associated with mercury related to application of an assumed fractional intake of 0.25 for hot spot analyses.

Similarly, for lead, an outlier with a concentration of 47,600 mg/kg was identified in Sample HS-6. Evaluations for lead are based on average values in calculations conducted through application of the ALM. The mean concentration for lead including the outlier value was 2,110 mg/kg and the mean excluding the outlier was 642 mg/kg. Both values were included in risk estimates for lead in the ALM. Unlike estimates for mercury, no fractional intake was applied because the risk estimates were derived using average values.

5 Toxicity Assessment

The purpose of a toxicity assessment is to evaluate the potential for CoPCs to cause adverse health effects in exposed persons and to thoroughly define the relationship between the extent of exposure to a hazardous chemical and the likelihood and severity of any adverse health effects. The standard procedure for a toxicity assessment is to identify toxicity values for carcinogenic and noncarcinogenic effects and to summarize other relevant toxicity information. This section describes the methods used to evaluate toxicity that could result following oral, dermal, or inhalation exposure to CoPCs, and provides a brief toxicity profile for inorganic mercury, which was a key CoPC in this risk assessment. Section 6.3, *Uncertainty Assessment*, also discusses uncertainties in EPA's toxicity value for inorganic mercury.

EPA-derived toxicity values used in risk assessments are termed cancer slope factors (CSFs) and reference doses (RfDs). CSFs are used to estimate the incremental lifetime risk of developing cancer corresponding to CDIs calculated in the exposure assessment. The RME and central tendency potential for noncarcinogenic health effects is evaluated by comparing estimated daily intakes to RfDs, which represent daily intakes at which no adverse effects are expected to occur over a lifetime of exposure. Both CSFs and RfDs are specific to the route of exposure (e.g., ingestion [oral] exposure). Currently, no CSFs or RfDs exist for dermal exposure; therefore, oral absorption factors were used to adjust CSFs and RfDs to assess dermal exposure, as described in the subsection below. For inhalation, unit risk factors for carcinogens and reference concentrations for noncarcinogenic effects were applied. In some cases, where unit risk values and reference concentrations were not available, oral toxicity values were used through route conversions as applied by EPA Region IX in the spreadsheet presenting PRGs (U.S. EPA 2005a). Although this method was applied in order to evaluate all chemicals possible in the inhalation pathways, there is some uncertainty related to this approach and the assumption that inhalation risks are equivalent with oral risks may overestimate or underestimate risks for some chemicals.

As indicated in RAGS (U.S. EPA 1989), the primary source for EPA-derived toxicity values is EPA's Integrated Risk Information System (IRIS) (U.S. EPA 2005b). This computerized database contains peer reviewed toxicity values in addition to up-to-date health risk and EPA regulatory information for many chemicals commonly detected at hazardous waste sites. EPA extensively reviews and peer-reviews RfDs and CSFs derived for risk assessment, and once they are posted in IRIS (U.S. EPA 2005b), they represent agency consensus.

The second tier of toxicity values applied here were toxicity values identified by National Center for Environmental Assessment (http://cfpub.epa.gov/ncea/) (as cited by EPA Region IX), which are provisionally peer reviewed toxicity values. Where no other values were available, toxicity values from EPA's *Health Effects Assessment Summary Tables* (HEAST; U.S. EPA 1997b) were applied. In addition, as described above, inhalation toxicity values derived by EPA Region IX PRG spreadsheets (U.S. EPA 2005a) through route-to-route extrapolation were also applied where no other toxicity values were available. Appendix A Tables 5.1 and 5.2 show the toxicity values used in this risk assessment to assess noncarcinogenic effects related to oral and

inhalation exposures, respectively, and Appendix A Tables 6.1 and 6.2 present toxicity values for carcinogenic CoPCs for oral and inhalation exposures, respectively.

5.1 Toxicity Assessment for Dermal Exposure

As noted previously, EPA has not developed any toxicity values for dermal exposure. EPA suggests, however, that dermal toxicity values can be derived from oral toxicity values for substances with systemic effects that are not dependent on route of administration (U.S. EPA 1989). In deriving such values, consistency is required between the type of dose that forms the basis of the oral toxicity value and the type of dose that will be calculated by the dermal exposure models. Specifically, a distinction must be made between an administered dose or intake (i.e., the amount of chemical taken into the body) and the absorbed dose (i.e., the amount of chemical that crosses body membranes and enters the blood stream).

Typically, oral toxicity values and CDIs for oral exposure are based on administered doses (or intakes); therefore, usually no adjustments are necessary to calculate risk estimates for oral exposures. However, because dermal exposures are usually expressed in terms of absorbed doses, dermal toxicity values must also be based on absorbed, rather than administered, doses (U.S. EPA 2004). To derive a dermal toxicity value for absorbed dose from an oral toxicity value based on administered dose, the oral toxicity value is adjusted by an estimate of the fractional oral absorption (i.e., the oral absorption factor). A CSF is divided by the oral absorption factor, and an RfD is multiplied by the oral absorption factor to calculate the adjusted toxicity value.

U.S. EPA (2004) reviewed data on oral absorption of many chemicals and recommends adjustment factors for an oral slope factor/RfD, used to estimate dermal toxicity values. These adjustments are described in Appendix A, Tables 5.1 and 6.1, and were applied in estimates of dermal exposure to CoPCs in soil or water.

Dermal absorption from soil and from water is also a chemical-specific variable. For evaluation of soil and sediments, the recent EPA dermal risk assessment guidance provides chemical-specific dermal absorption values for several site CoPCs including arsenic, cadmium, PAHs, and PCBs. These chemicals were evaluated in the dermal exposure pathways for soil and sediments. Consistent with EPA guidance, remaining site CoPCs that have no identified absorption factors from soil or sediments were addressed qualitatively in the dermal assessment.

Estimation of dermal absorption from water requires application of a permeability constant, which was also identified by U.S. EPA (2004) and in comments from NJDEP (2001). Consistent with both of these guidance documents, where no permeability constant was available, the chemical was not evaluated in the dermal exposure pathway.

Appendix A Tables 5.1 and 6.1 provide the oral absorption factors and adjusted toxicity values used for relevant CoPCs in this risk assessment.

5.2 Toxicity Profiles

Toxicity profiles provided by EPA in the IRIS database were referred to in preparing this assessment. These profiles can be accessed through the EPA web site (www.epa.gov/iris/subst/index.html). This section provides a brief summary of the EPA toxicity value for inorganic mercury (mercuric chloride), which is one of the main contributors to OU1 risk estimates.

Estimates of potential risks associated with inorganic mercury are based on EPA's current RfD of 0.0003 mg/kg-day, which is based on feeding and injection studies in rats. The RfD was derived by applying an uncertainty factor of 1,000 to the lowest-observed-adverse-effect level identified from three studies. The primary adverse effect in these studies, identified at higher concentrations, was an autoimmune effect on the kidney. EPA indicated that "No one study was found adequate for deriving an oral RfD; however, based on the weight of evidence from the studies using Brown Norway rats and the entirety of the mercuric mercury data base, an oral RfD of high confidence results." Because there was no chronic oral study to apply as the basis for the RfD, the RfD was based on a combination of studies conducted in a shorter time frame (subchronic studies) using both the oral and subcutaneous routes. EPA applied an uncertainty factor of 1,000 to the lowest-adverse-effect level to account for the use of a subchronic study and the availability of a lowest-adverse-effect level (as opposed to a no-adverse-effect level), and to account for the relative increased sensitivity of human populations. The uncertainty assessment discusses uncertainties related to the application of this RfD in the risk assessment to evaluate chronic human exposure resulting from oral contact with mercury.

6 Risk Characterization

In risk characterization, quantitative exposure estimates and toxicity factors are combined to calculate numerical estimates of potential health risk. In this section, potential cancer and noncancer health risks are estimated assuming long-term exposure to CoPCs detected in OU1 media. As described in Section 4, *Exposure Assessment*, potential risks are estimated for the future worker and trespasser scenarios to provide a health protective means of considering possible future uses. The risk characterization methods described in RAGS (U.S. EPA 1989) are used to calculate potential RME and central tendency excess lifetime cancer risks for carcinogens, and hazard indices for CoPCs with noncancer health effects. These methods and the results of the risk characterization are described below. Tables 6-1 and 6-2 show excess cancer risk estimates for the RME and central tendency scenarios, while Tables 6-3 and 6-4 present RME and central tendency hazard indices. In addition, tables in Appendix A present detailed results of the risk calculations for each exposure pathway, including EPCs and CDIs calculated for the RME and central tendency scenarios, toxicity values used in risk estimates, and potential risk estimates for each CoPC in each exposure pathway.

6.1 Carcinogens

6.1.1 Methods

Quantifying total excess cancer risk requires calculating risks associated with exposure to individual carcinogens and aggregating risks associated with simultaneous exposure to multiple carcinogenic CoPCs. A cancer risk estimate for a single carcinogen is calculated by multiplying the carcinogenic CDI of the CoPC by its slope factor. A 1×10^{-6} cancer risk represents a one-in-one-million additional probability that an individual may develop cancer over a 70-year lifetime as a result of the exposure conditions evaluated. Because cancer risks are assumed to be additive, risks associated with simultaneous exposure to more than one carcinogen in a given medium are aggregated to determine a total cancer risk for each exposure pathway. Total cancer risks for each pathway are then summed for reasonable combinations of exposure pathways, to determine the total cancer risk for the population of concern.

EPA's *Guidelines for Cancer Risk Assessment* states, "…the linearized multistage procedure (typically used to calculate CSFs) leads to a plausible upper limit to the risk that is consistent with proposed mechanisms of carcinogenesis…The true value of the risk is unknown, and may be as low as zero" (51 Fed. Reg. 185:33992, 33998 [1986]). Because of uncertainties in methods available to assess risk, it is also possible that risks are underestimated.

Although the determination of an acceptable risk level is ultimately a decision to be made by risk managers, the findings presented here are compared with the range of acceptable risk levels cited in EPA's National Contingency Plan (NCP) (U.S. EPA 1990b), which EPA describes as the "blueprint for the Superfund law." The NCP states that risk levels in the range of 10^{-4} to 10^{-6} and lower are considered to be within the range of acceptable risks for Superfund sites.

6.1.2 Quantification of Carcinogenic Risks

Carcinogenic risk estimates were calculated for older children and adults in the RME and central tendency scenarios as the probability of additional cancers associated with the exposure pathways evaluated. Appendix A, Tables 8.1.RME through 8.25.RME provide carcinogenic risk estimates for the RME scenario; Tables 8.1.Central Tendency through 8.25.Central Tendency provide carcinogenic risk estimates for the central tendency scenario, and these values are further summarized for each receptor in Appendix A Tables 9.1.RME through 9.13.RME and Appendix A Tables 9.1.Central Tendency through 9.13.Central Tendency. In addition, Table 6-1 provides risk estimates for CoPCs in the RME scenario, and Table 6-2 provides a summary of risk estimates for all complete exposure pathways in the central tendency scenario. These tables also provide a summary of CoPCs that account for primary contribution of the risk estimates in each pathway. Appendix A Tables 10.1 through 10.13 provide estimates for chemicals in pathways with RME cancer risk estimates greater than 1×10^{-6} or hazard indices greater than 1.

Estimated total cancer risks for both RME and central tendency scenarios were within the 10^{-6} to 10^{-4} target risk range identified above, with one exception. The future hypothetical residential use of groundwater had a risk estimate of 4×10^{-4} (i.e., with ingestion, inhalation, and dermal contact combined). The next highest risk estimate for a receptor was the combined estimate of 9×10^{-5} for the worker in the undeveloped area, or in the developed area, primarily related to hypothetical consumption of groundwater, ingestion and dermal contact with soil, and inhalation of volatile constituents in indoor air. Risk estimates for ingestion of groundwater were primarily related to ingestion of arsenic in groundwater, and inhalation of benzene volatilized from groundwater. Estimates for soil were primarily related to arsenic and PAHs in the developed area and arsenic, PAHs, and PCBs in the undeveloped area. Indoor air risk estimates were primarily related to estimated concentrations of benzene for indoor air in the developed area and benzene and benzo[a]pyrene in the undeveloped area.

Trespassers on the undeveloped area had a total risk estimate of 4×10^{-5} for ingestion and dermal contact with soils, and the total estimate for the hypothetical trespassers within the West Ditch or the onsite basin was 2×10^{-5}. Risks for this scenario were also related primarily to arsenic and PAHs in soil and sediments. There were no carcinogenic CoPCs in surface water and, thus, no risk estimates. All risk estimates for the construction workers' contact with soil were below 1×10^{-6} in the developed area and were 5×10^{-6} in the undeveloped area.

6.2 Noncarcinogens

6.2.1 Methods

Unlike carcinogenic effects, other potential adverse health effects are not expressed as a probability. Instead, these effects are expressed as the ratio of the estimated exposure over a specified period to the RfD derived for a similar exposure period (e.g., CDI:chronic RfD). This ratio is termed a hazard quotient. If the CDI exceeds the RfD (i.e., hazard quotient greater than 1), there may be concern for noncancer adverse health effects. Exposures resulting in a

hazard quotient less than or equal to 1 are very unlikely to result in noncancer adverse health effects. Because EPA states that the range of possible values around RfDs is "perhaps an order of magnitude" (U.S. EPA 2005b), the significance of intakes exceeding the RfD by one-half an order of magnitude or less (i.e., hazard quotients ranging from 0.5 to 5) must be considered carefully (see Section 6.3.1). In initial risk calculations, hazard quotients for individual CoPCs are summed for each exposure pathway to derive a hazard index. Hazard indices for each exposure pathway are then summed to determine the total hazard index for each population of concern.

6.2.2 Quantification of Noncarcinogenic Risks

Appendix A, Tables 7.1.RME through 7.25.RME provide hazard indices for all chemicals in all pathways, and Tables 7.1.Central Tendency through 7.25.Central Tendency provide hazard indices for all chemicals in all pathways. Appendix A, Tables 9.1.RME through 9.13.RME and 9.1.Central Tendency through 9.13.Central Tendency provide further summaries, and Appendix A Tables 10.1 through 10.13 provide estimates for chemicals in pathways with RME cancer risk estimates greater than 1×10^{-6} or hazard indices greater than 1. Tables 6-3 and 6-4 summarize total hazard indices calculated for RME and central tendency scenarios, respectively. These tables also show the CoPCs with primary input into the hazard index for each pathway. For the current scenarios, the construction workers in the developed and undeveloped areas and the adult and older child trespasser/visitor scenarios in the undeveloped area had hazard indices greater than 1 in estimates for exposure to soil and to sediments. Specifically, for construction workers, mercury in soil was the primary contributor to a hazard index of 7.8 in the developed area, and to a hazard index of 2.8 in the undeveloped area. For trespasser scenarios, the hazard indices for soil exposures in the current and future scenarios were 1.4 and 1.9 for adults and children, respectively, and the hazard indices for trespassers' exposure to sediments and surface water were 2.4 and 3.4 for adults and children, respectively. Hazard indices were primarily related to chromium and mercury in soil and mercury in sediments. No other current exposure scenarios had hazard indices greater than one. In the future scenarios, the exposure estimates and risks were assumed to remain the same for construction workers and trespassers.

For long-term workers in the developed area the future hazard index was 2.3 for exposures to surface soil (almost entirely related to mercury) and 2.5 for assumed consumption of groundwater as workplace drinking water (related to multiple chemicals including thallium, mercury, manganese, and arsenic).

For long-term workers in the undeveloped area the hazard indices were 1.1 for exposures to surface soil (almost entirely related to mercury), 5.7 for inhalation of naphthalene and xylene volatilized into indoor air from soil, and 2.5 related to assumed consumption of groundwater as workplace drinking water (related to multiple chemicals including thallium, mercury, manganese, and arsenic).

The hypothetical future use of groundwater as residential drinking water had the highest hazard indices in the assessment, with all hazard indices greater than one and a maximum estimate of 75 in the child scenario with a hazard index of 49 related to inhalation of volatile constituents while bathing (primarily naphthalene with a hazard index 32), and 25 related to consumption of

groundwater. The inhalation hazard indices were primarily related to naphthalene and the drinking water hazard indices were related to multiple chemicals including mercury (hazard index of 6.1), manganese (hazard index of 3.9), arsenic (hazard index of 3.0), and thallium (hazard index of 6.8).

Hazard indices were less than one for outdoor air.

6.2.3 Hazard Indices Including Outlier Values

As described above, hazard indices were calculated through application of UCLs that included the outlier values identified as hot spots for mercury and through application of a fractional intake of 0.1 (Table 6-5). Hazard evaluations for lead including evaluations of hot spot values are discussed in the next section. In the developed area, a hazard index of 0.76 was calculated using the UCL incorporating the hot spot value of 13,800 mg/kg and a fractional intake of 0.1. In the undeveloped area a hazard index of 14 was calculated using the UCL incorporating the hot spot value of 295,000 mg/kg and a fractional intake of 0.1. These hazard indices were primarily related to mercury in soil.

6.2.4 Hazard Evaluation for Lead

Application of the ALM resulted in predicted blood lead levels in the most sensitive population (developing fetus) that were greater than the acceptable level in two scenarios:

- Hypothetical exposure of pregnant female workers to surface soils in the undeveloped area based on the average value of 2,110 mg/kg, which included the outlier value of 47,600 mg/kg, resulted in an estimated geometric mean blood lead level in the fetus of pregnant women of 15 μg/dL, with a 15 percent chance of exceeding the target blood lead level of 10 μg/dL.
- The ALM estimate for pregnant female construction workers in the undeveloped area subsurface soils, which was based on the EPC of 2,096 mg/kg, resulted in an estimated geometric mean blood lead level in the fetus of pregnant women of 16 μg/dL, with a 16 percent chance of exceeding the target blood lead level of 10 μg/dL.

Remaining estimates derived by the ALM were within the target level of no greater than a 5 percent chance of exceeding the target blood lead level of concern of 10 μg/dL (Tables D-1 through D-8).

6.3 Uncertainty Assessment

Because risk characterization serves as a bridge between risk assessment and risk management, it is important that major assumptions, scientific judgments, and estimates of uncertainties be described in the assessment. Risk assessment methods are designed to be conservative to address the uncertainties associated with each step in the risk assessment process.

Key factors in risk assessment methods that are likely to result in underestimates or overestimates of potential site risks include the following:

- Scenarios regarding future site use are estimates and may reflect higher or lower exposures than actual use patterns.
  - In particular, future use of groundwater as drinking water is highly unlikely, given the availability of other water sources
  - Trespassing is also highly unlikely, given the site location and conditions.
- Dermal exposure to chemicals in soil and sediments was evaluated for only a subset of chemicals where absorption data were adequate. Exclusion of other chemicals is likely to underestimate risks somewhat.
- Site-specific data on background concentrations of metals in soil, sediment, and water were not available. Site-related risks may have been overestimated if these metals were also present in background media at similar concentrations.
- Use of EPA's CSFs for carcinogens, which are based on the assumption that any exposure to a carcinogen is associated with some risk of cancer, is likely to overestimate risks.
- Use of studies conducted in animals dosed at high levels to derive toxicity values may overestimate risks in human populations exposed at much lower levels.

The following sections provide more discussion regarding the potential for uncertainties related to toxicity value exposure assumptions to result in overestimates or underestimates of risk.

6.3.1 Influence of Background Arsenic Concentrations

Regarding the cancer risk estimate for arsenic in soil, the contribution from naturally occurring background sources of arsenic in soil should be considered in evaluating the risk estimates. Although site-specific background data are not available, background data for the state of New Jersey suggest that the arsenic concentrations in OU1 soils may not differ from those that would be found associated with soils that have no known source of arsenic (i.e., background locations).

As is indicated in Table 6-6, the OU1 soil arsenic concentrations are either within or similar to the range of concentrations identified as background within New Jersey soils. Therefore, risks related to exposure to arsenic in OU1 soil may be similar to those for locations with naturally occurring arsenic in soils.

6.3.2 Influence of Regional Mercury Sources on Ambient Air Concentrations

Multiple sources contribute to mercury concentrations in ambient air. The New Jersey Division of Science, Research, and Technology of NJDEP has summarized information on mercury in New Jersey's environment in a chapter entitled *Chapter 7—Occurrence and Impact of Mercury in NJ's Environmental Media* (www.state.nj.us/dep/dsr/vol2-chapter7.pdf). According to the chapter, both natural and anthropogenic sources contribute to mercury in New Jersey. One investigation cited in the chapter indicated that 67 percent of environmental mercury in New Jersey comes from regional and global sources, with the remainder from instate sources. Regarding mercury concentrations in air, the chapter noted that mercury in ambient air generally ranges from 1 to 6 ng/m^3, based on several studies around the world. While no representative data for New Jersey were identified in the chapter, a national background concentration for elemental mercury in air of 1.6 ng/m^3 was noted, based on the *Report to Congress* (U.S. EPA 1997c). Although site-specific inputs may clearly be the dominant source at a given location, all locations are subject to some regional and global input.

6.3.3 Uncertainties Related to Modeling

As described above, health protective assumptions were applied in modeling conducted for indoor air. In particular, the assumption that groundwater would be used as a drinking water source for workers or for residents is highly unlikely and provides risk estimates that are not currently applicable at the site. Moreover, modeling of indoor air concentrations related to domestic use of groundwater is also highly health protective and is likely to overestimate health risks even if such an unlikely scenario were to occur. In the case of Johnson and Ettinger modeling conducted to evaluate indoor air concentrations related to volatilization from soil or groundwater, aspects of this modeling may underestimate or overestimate risks[3]. For example, the Johnson and Ettinger model assumption of a homogeneous substrate may result in under- or overestimation of risks. Because the subsurface in the undeveloped area does not consist of unaltered geological soil profiles, the heterogeneity of the fill areas may allow a higher or lower degree of migration than assumed in the model estimates. Finally, EPA has raised concern that the model may underestimate risks from shallow contamination because of the way that attenuation is modeled.

6.3.4 Uncertainties Related to Assumed Soil Ingestion Rates

As indicated in Section 4.3.2, a soil ingestion rate of 50 mg/day was applied in the risk calculations for onsite workers. This ingestion rate reflects the assumption that the current site use (i.e., indoor activities in the warehouse) is anticipated to continue in the future. However, because there is some uncertainty related to this use, risk calculations assuming an ingestion rate of 100 mg/day to represent an outdoor worker were also conducted to evaluate the impact on risk estimates. Doubling the assumed ingestion term (i.e., from 50 mg/day to 100 mg/day) would result in a doubling of risk estimates for the soil ingestion pathway. This does not,

[3] This revision also addresses comment 7. Given the uncertainties raised about the Johnson and Ettinger model, Exponent has decided to remove the discussion about the potential for overestimates related to the model.

however, identify any new areas as being greater than either end of the cancer risk range identified by EPA. Specifically, cancer risk estimates doubled for worker soil ingestion risk estimates, but remained within the same risk range of 1×10^{-6} to 1×10^{-4}.

Similarly, in the calculation of hazard indices for effects other than cancer, the only area where the evaluation of a 100 mg/day ingestion rate would result in a hazard index greater than one was the current scenario for ingestion of surface soil in the developed area, which changed from a hazard index of 0.58 to a hazard index of 1.12, primarily because of mercury. In the remaining scenarios, the hazard indices for exposure to CoPCs in surface soil were already greater than 1 under the assumption of an indoor worker with an ingestion rate of 50 mg/day. Thus, although the application of an ingestion rate of 100 mg/day results in a doubling of the risk estimate, this does not result in identification of additional areas exceeding risk or hazard thresholds identified by EPA.

6.3.5 Uncertainties Related to Assumed Fractional Intake in Mercury Hot-Spot Analyses

As indicated in Section 4.3.12, two sample locations were identified with mercury concentrations much higher than remaining values: SS-04 in the developed area and HS-5 in the undeveloped area. These sample locations were identified as hot spots and evaluated as such within the risk assessment. The maximum mercury value in the developed area (all soils) was 13,800 mg/kg at station SS-04, which is much higher than the next highest concentration (2,250 mg/kg). UCLs were calculated including and excluding this value. The resulting UCLs were 3,861 mg/kg and 1,312 mg/kg; both were applied as EPCs in risk calculations in the HHRA. In addition, in the undeveloped area, Sample HS-5, a hazardous waste sample, had a concentration of 295,000 mg/kg and was also identified as an outlier. Calculations were conducted including and excluding this value. The UCL including the outlier was 80,838 mg/kg and recalculation of the UCL without the outlier resulted in a value of 181 mg/kg. Both of these UCLs were used in risk estimates for surface soil in the undeveloped area.

Because the outlier values have a large influence on the resulting UCL, but do not represent a substantial proportion of the site area, a fractional intake of 0.1 was applied in RME risk calculations for the outlier analyses of mercury, in agreement with EPA. Central tendency calculations were conducted through application of a fractional intake of 0.05. Because of uncertainties related to the fractional intake, an additional calculation was conducted applying a fractional intake of 0.25, which resulted in a hazard index of 1.7 for workers in the developed area and 34 for workers in the undeveloped area, related to exposure to mercury in surface soil. However, this fractional intake assumes that one quarter of the site area would be affected by concentrations at the single hot spot sample location in each of the areas, which is likely to be an overestimate based on the site concentration data.

7 Conclusions

On behalf of Rohm and Haas Company, Exponent prepared an HHRA for OU1 of the site located in Wood-Ridge and Carlstadt, New Jersey. The objective of the baseline HHRA was to quantify human health risks associated with CoPCs within OU1 in the absence of any action to control or mitigate those CoPCs (i.e., under the no-action alternative). The HHRA focused on current and hypothetical future conditions that assumed use of both the undeveloped and the developed areas as workplaces in the future. Potential risk estimates for carcinogens were compared to the range of target excess risk levels (1×10^{-6} to 1×10^{-4}) identified by EPA in the NCP. Potential risk estimates for noncarcinogens were compared with a hazard index of 1.

Intakes of CoPCs were estimated using algorithms and assumptions consistent with EPA guidance (e.g., U.S. EPA 1989). Exposure pathways evaluated included contact (i.e., ingestion and dermal contact) with surface and subsurface soils, sediment, surface water and groundwater, and inhalation of outdoor air and indoor air potentially affected by volatilization of chemicals from subsurface soil or groundwater. Lead was also evaluated using the ALM. Scenarios evaluated included the long-term worker, construction worker, trespasser, and hypothetical future consumption of groundwater as drinking water.

Evaluation of hypothetical residential future consumption of drinking water resulted in a cancer risk estimate of 4×10^{-4}, which is greater than the upper end of the target risk range (i.e., 1×10^{-4}), primarily related to ingestion of arsenic in water and inhalation of benzene volatilized to indoor air. All other pathways were within the target risk range of 1×10^{-6} to 1×10^{-4}. Non-cancer hazard indices greater than the target of 1 were identified for the following exposure pathways:

- Contact with surface soil (assuming all pavement was removed) or subsurface soil in the developed area for long term workers and construction workers, respectively
- Contact with surface soil by long term workers or trespassers or contact with subsurface soil by construction workers in the undeveloped area
- Consumption of drinking water by either hypothetical future workers or residents.

Hazard indices calculated including two outlier values for mercury (hot spot sample locations) resulted in the highest hazard indices for the undeveloped area.

Evaluations for lead carried out with the ALM indicated predicted blood lead levels in the most sensitive population (developing fetus) greater than the acceptable level in two scenarios:

- The ALM estimate for the undeveloped area surface soils, which evaluated hypothetical exposure of pregnant female workers based on the average lead concentration including the hot spot value;

- The ALM estimate for pregnant female construction workers who might contact lead in the undeveloped area subsurface soils.

Remaining estimates derived by the ALM were within the target level of no greater than a 5 percent chance of exceeding the target blood lead level of concern of 10 μg/dL.

The findings of the baseline risk assessment were taken into account in the development of remedial action objectives and remedial alternatives for soil and groundwater presented in the feasibility study (CH2M Hill 2005).

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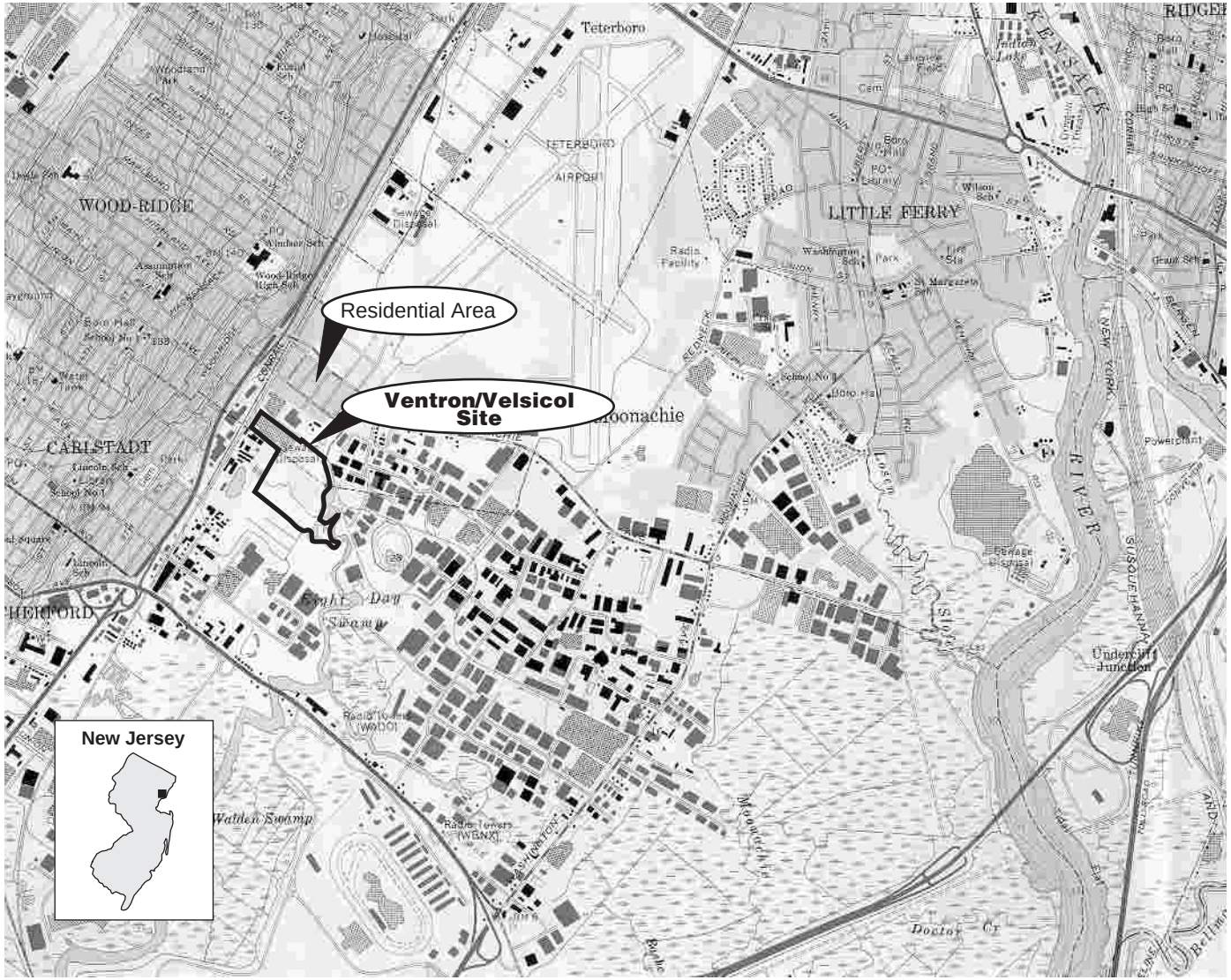
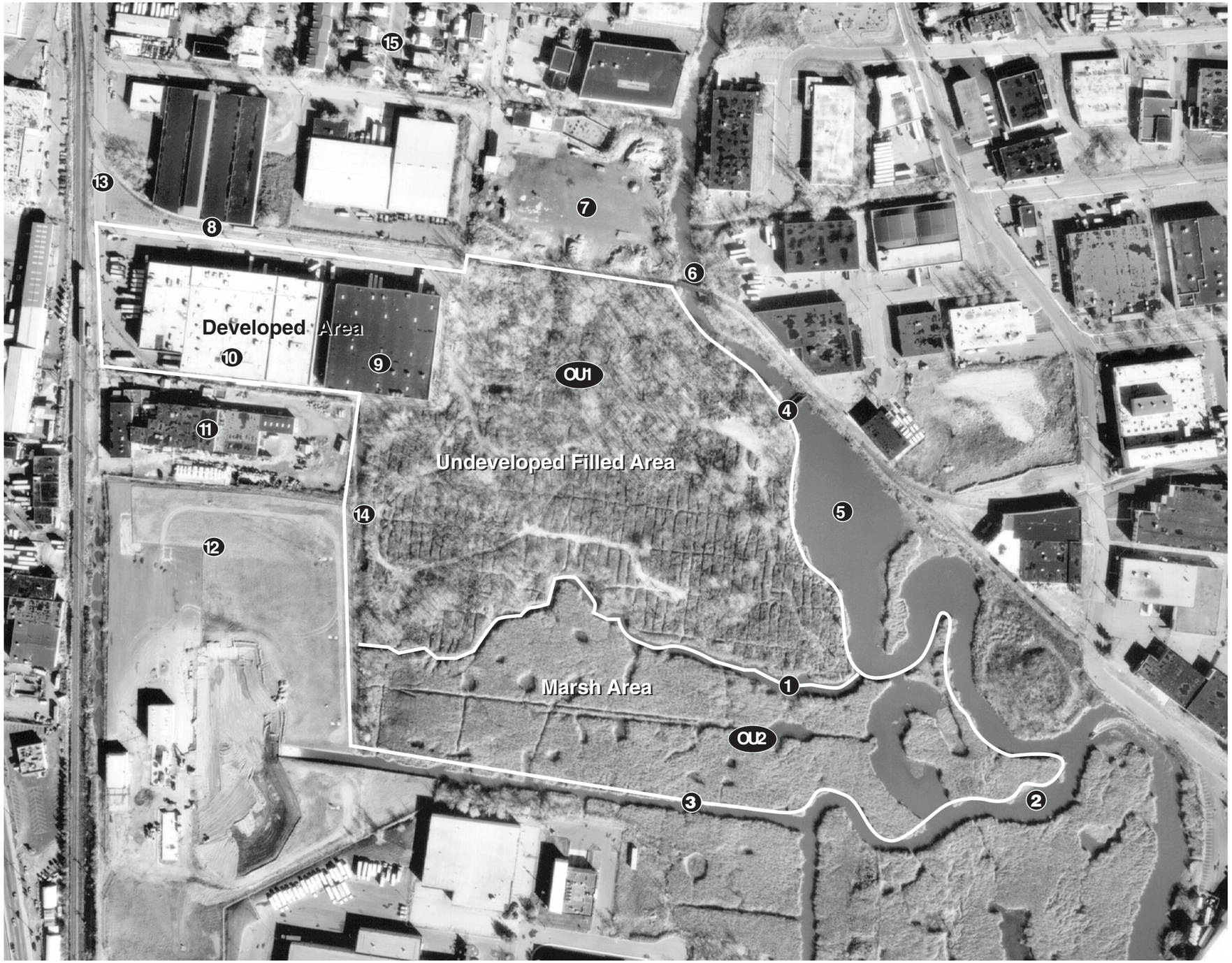
Figures



Base map source: USGS Weehawken, NJ-NY quadrangle

Figure 1-1. Site location map.



Photograph source: James Stewart, Inc. (November 29, 1997)

LEGEND

1. Diamond Shamrock/Henkel ditch (north)
2. Nevertouch Creek
3. Diamond Shamrock/Henkel ditch (south)
4. Tide gate
5. Berry's Creek
6. Railroad bridge
7. Former POTW
8. Ethel Boulevard
9. Wolf warehouse
10. U.S. Life warehouse
11. Randolph Products
12. Diamond Shamrock/Henkel Property
13. Park Place East
14. West ditch
15. Residential Area

Site boundary shown as white line

OU1 Operable Unit 1

OU2 Operable Unit 2

0 200 feet
approximate scale

Figure 1-2. Site layout map.

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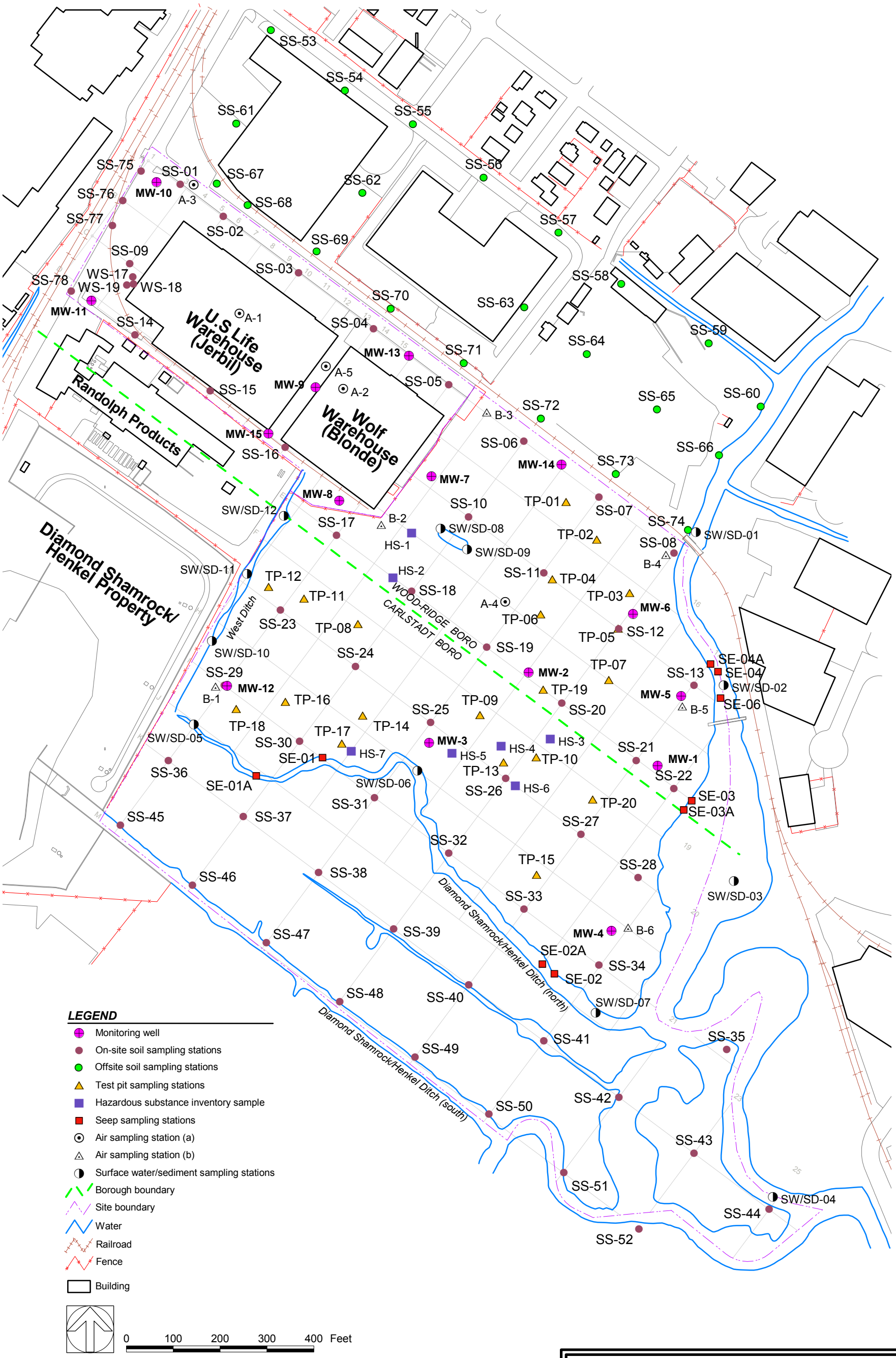


NOTE: The warehouse evaluation samples and interior soil samples appear on Figure 2-2 in the RI.

Source map survey by: James Stewart, Inc.

Figure 3-1. Remedial investigation sample locations.

8600B3N.001.0401 04/25/01 OR / Sample locations/e:/graphics/ventron_velsicol/woodridge.apr

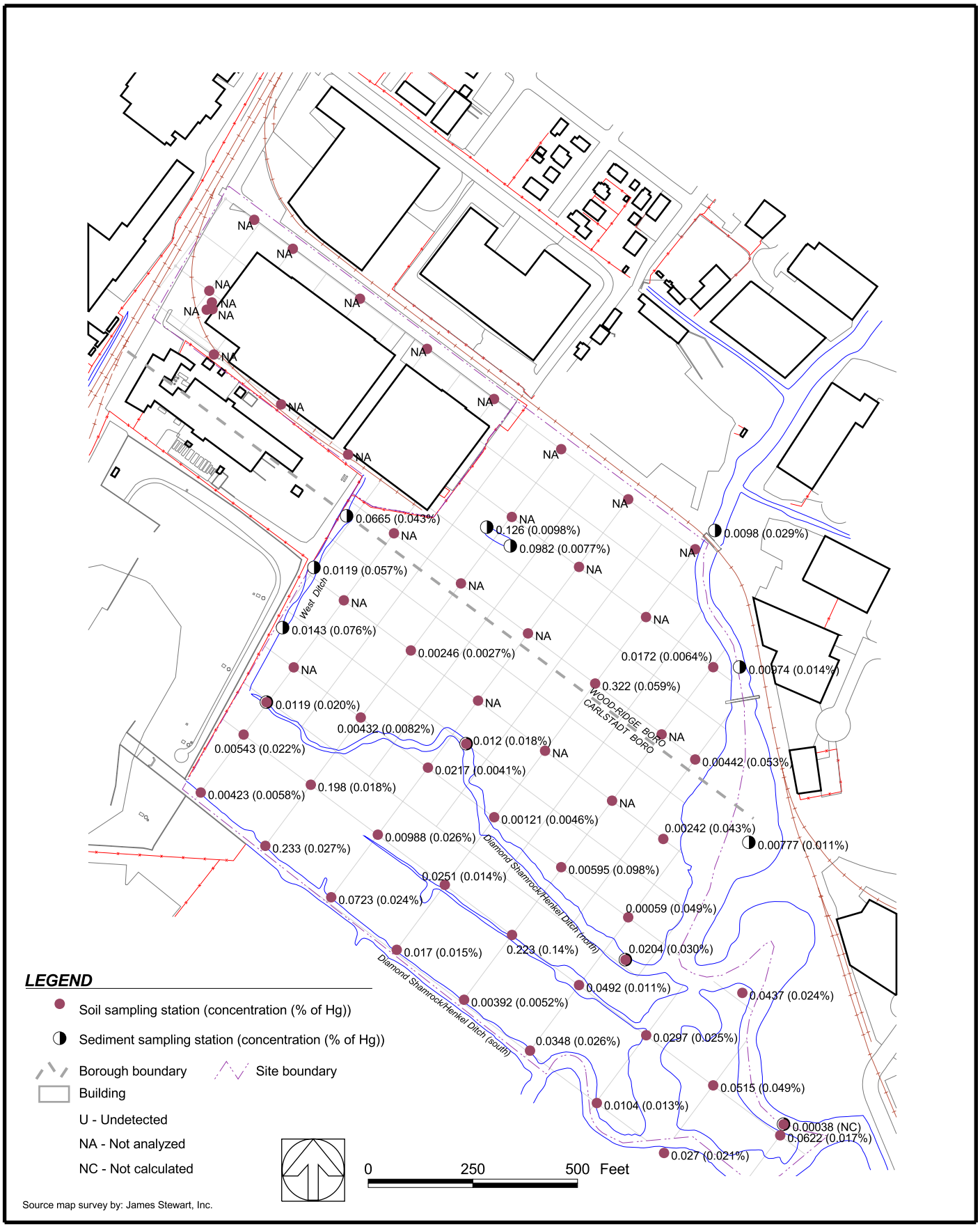


Figure 3-2 . Methylmercury concentrations (mg/kg and as percentage of total mercury) in surface soils and sediments.

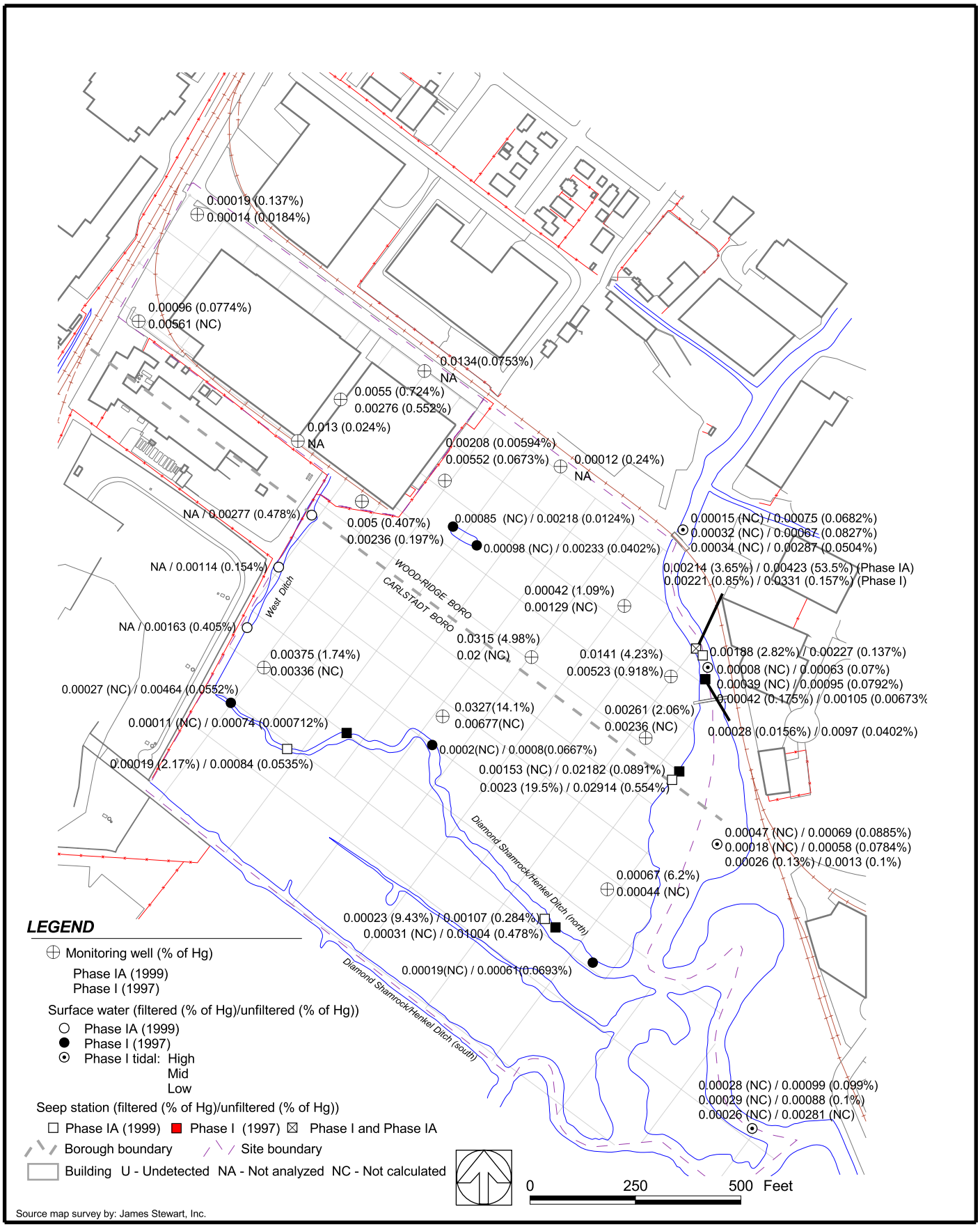


Figure 3-3. Methylmercury concentrations (µg/L and as percentage of total mercury) in surface water, seeps, and groundwater.

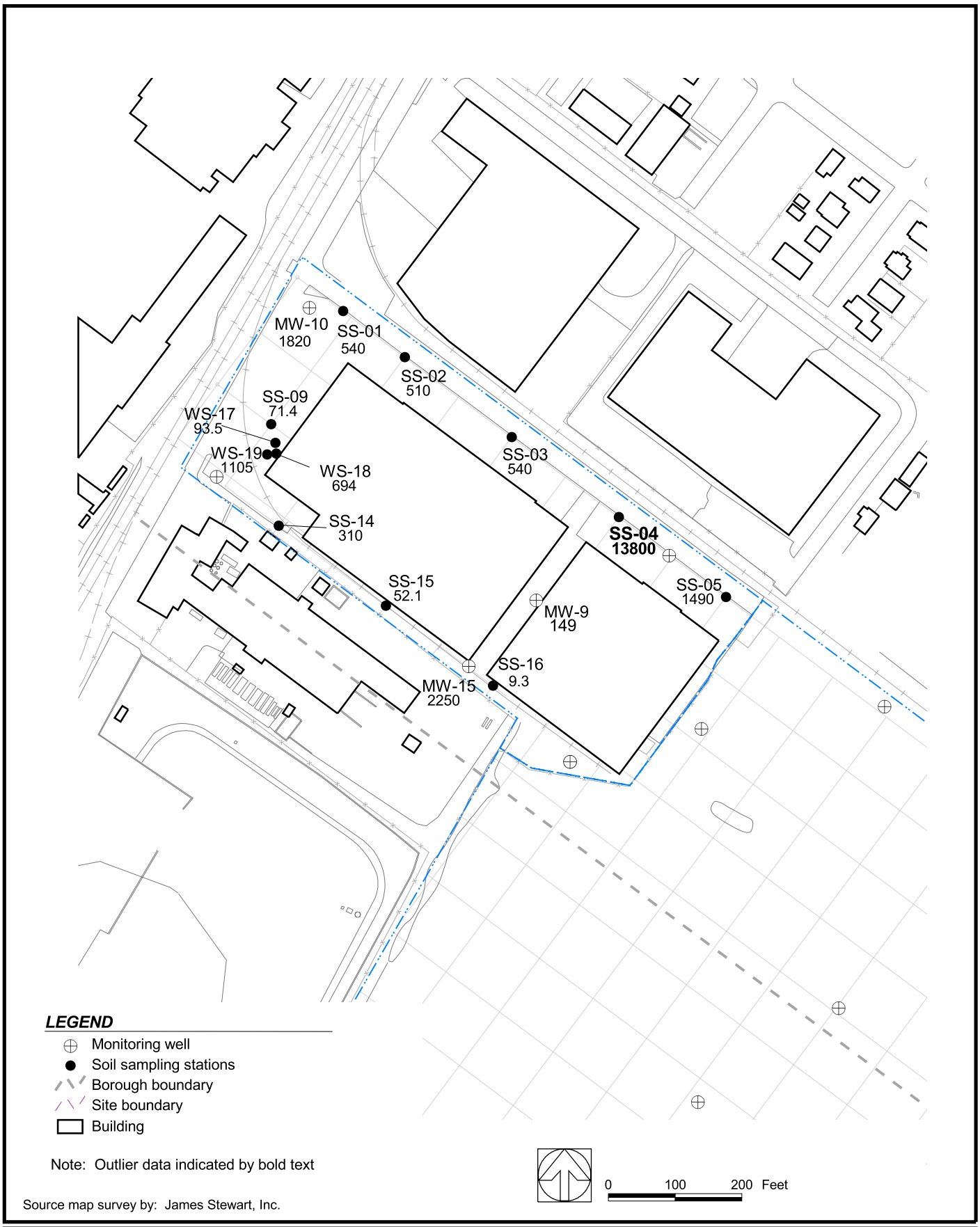


Figure 4-1. Mercury concentrations (mg/kg) in surface soils, developed area

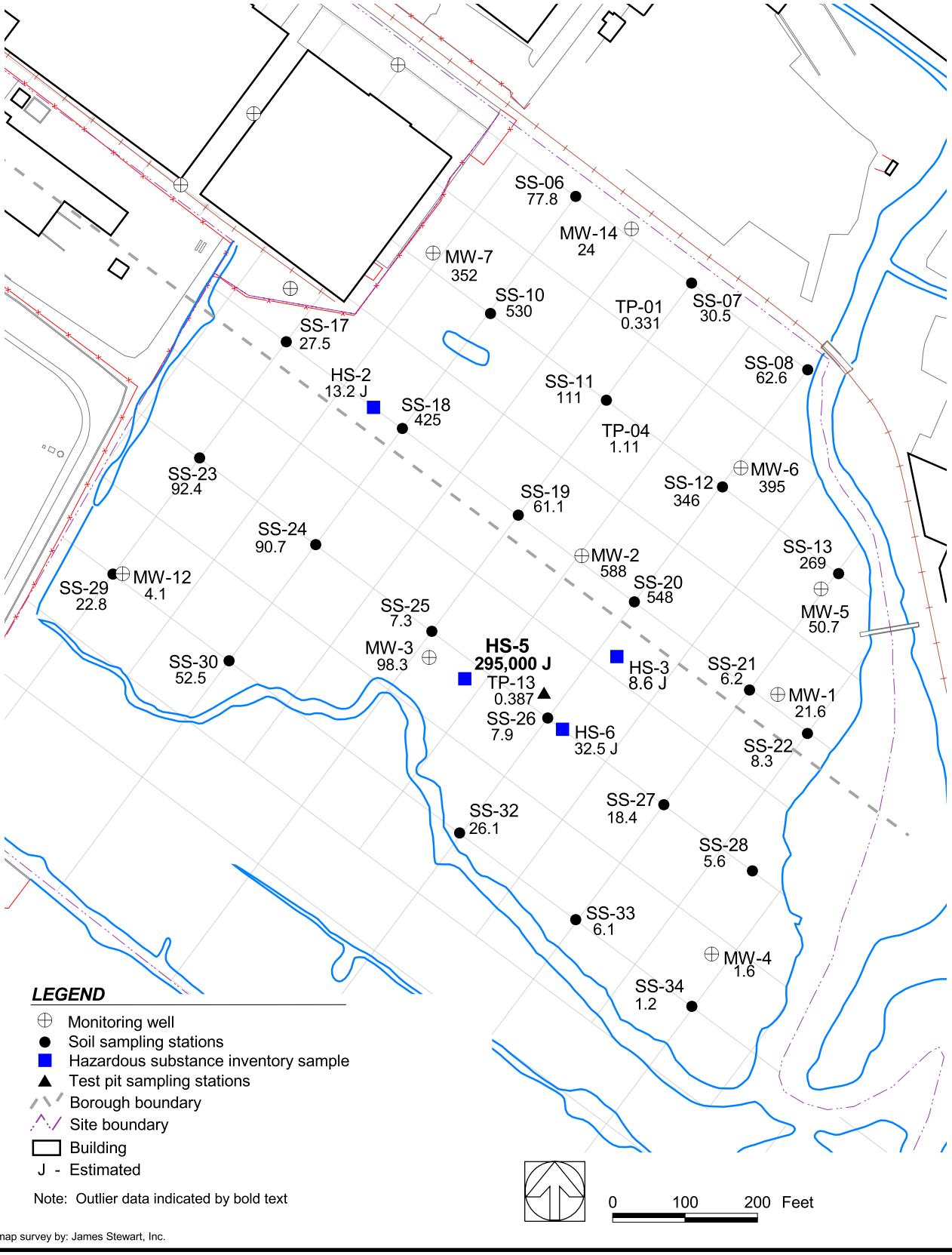
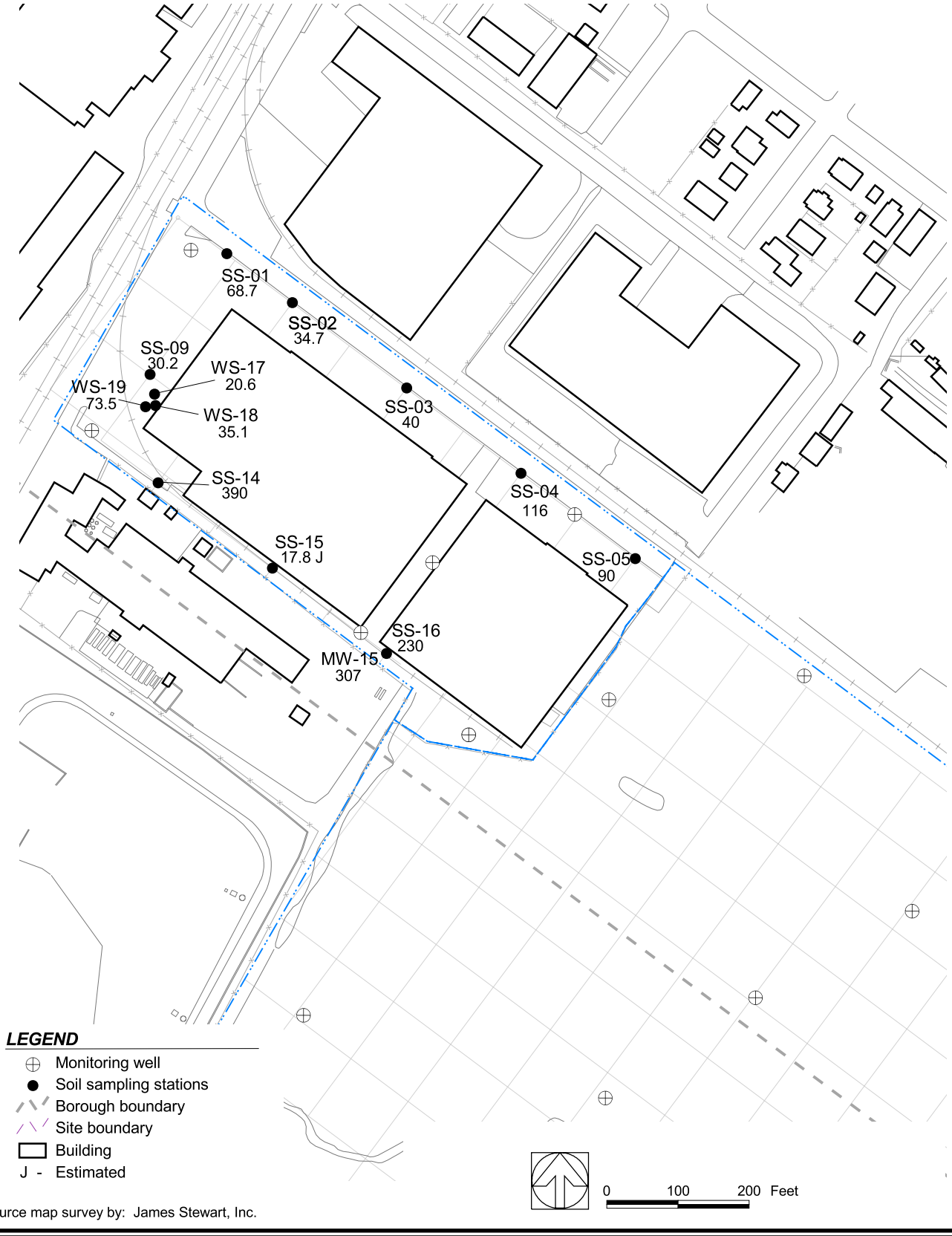


Figure 4-2. Mercury concentrations (mg/kg) in surface soils and hazardous substance inventory, undeveloped area



Source map survey by: James Stewart, Inc.

Figure 4-3. Lead concentrations (mg/kg) in surface soils, developed area

8600 | Aug 27,2004 | View1Onsite Pb | Onsite Pb | e:\graphics\ventron_velsicol\woodridge_3.apr

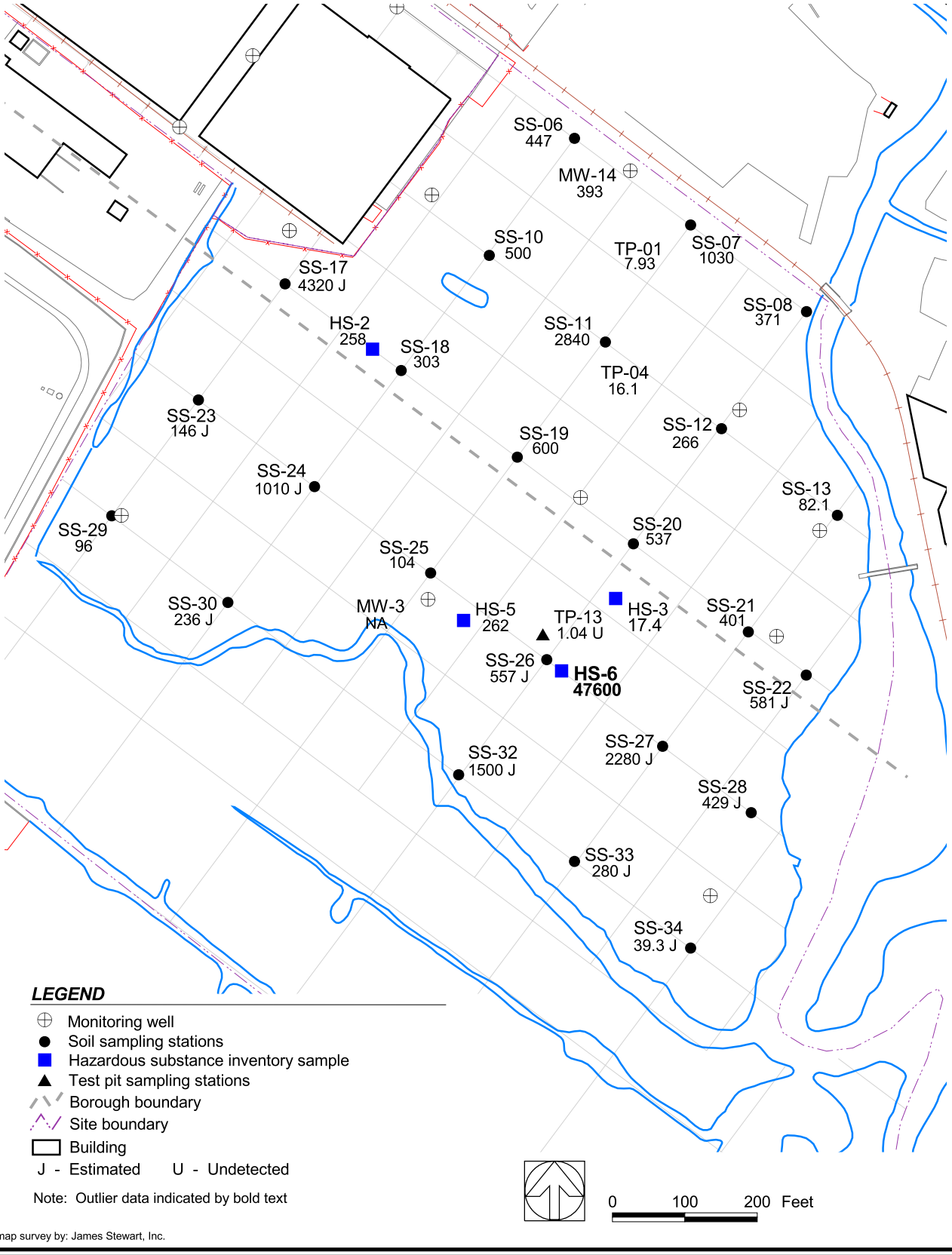


Figure 4-4. Lead concentrations (mg/kg) in surface soils and hazardous substance inventory, undeveloped area

Tables

Table 3-1. Contaminants of potential concern in various media at OU1 of the Ventron/Velsicol site

Analyte	Developed Area Soils (current scenario) (0–12 in.)	Developed Area Soils (future scenario) (0–12 in.)	Undeveloped Area Sediments (0–12 in.)	Undeveloped Area Soils and Wastes (0–12 in.)	Developed Area Subsurface Soils	Undeveloped Area Subsurface Soils	Surface Water	Ground-water	Outdoor Air	Indoor Air from Developed Area Subsurface Soils	Indoor Air from Undeveloped Area Subsurface Soils	Indoor Air from Developed Area Groundwater	Indoor Air from Undeveloped Area Groundwater
INORGANIC ANALYTES													
Antimony				X		X							
Arsenic	X	X	X	X	X	X		X					
Barium				X	X	X		X					
Cadmium			X	X		X		X					
Chromium	X	X	X	X	X	X			X				
Copper	X	X		X	X	X		X					
Lead				X		X							
Manganese	X	X		X	X	X	X	X					
Mercury (total)	X	X	X	X	X	X	X	X					
Methylmercury[a]			X	X		X	X	X					
Mercury vapor									X				
Nickel				X		X		X					
Selenium						X							
Silver				X		X							
Thallium		X	X	X	X	X		X					
Vanadium	X	X	X	X		X		X					
Zinc			X	X		X							
ORGANIC ANALYTES													
Semivolatile Organic Analytes													
4-Methylphenol								X				X	X
bis[2-Ethylhexyl]phthalate				X									
Carbazole						X					X		
Volatile Organic Analytes													
1,4-Dichlorobenzene								X				X	X
1,2-Dichloroethene, isomers								X				X	X
Dibenzofuran						X					X		
Benzene		X			X			X		X		X	X
Chlorobenzene								X				X	X
Chloroethane								X				X	X
Toluene						X		X			X	X	X
Xylenes						X		X			X	X	X
Polycyclic Aromatic Hydrocarbons													
2-Methylnaphthalene				X	X	X		X					
Benz[a]anthracene		X	X	X		X					X		
Benzo[a]pyrene	X	X	X	X		X					X		
Benzo[b]fluoranthene	X	X	X	X		X					X		
Benzo[ghi]perylene						X					X		
Benzo[k]fluoranthene						X					X		
Dibenz[a,h]anthracene	X	X	X	X		X					X		
Indeno[1,2,3-cd]pyrene			X	X		X					X		
Naphthalene				X		X		X			X	X	X

Table 3-1. (cont.)

Analyte	Developed Area Soils (current scenario) (0–12 in.)	Developed Area Soils (future scenario) (0–12 in.)	Undeveloped Area Sediments (0–12 in.)	Undeveloped Area Soils and Wastes (0–12 in.)	Developed Area Subsurface Soils	Undeveloped Area Subsurface Soils	Surface Water	Ground-water	Outdoor Air	Indoor Air from Developed Area Subsurface Soils	Indoor Air from Undeveloped Area Subsurface Soils	Indoor Air from Developed Area Groundwater	Indoor Air from Undeveloped Area Groundwater
Polychlorinated Biphenyls													
Aroclor® 1242						X							
Aroclor® 1248			X	X		X							
Aroclor® 1254						X							
Aroclor® 1260			X		X								

Note: OU - operable unit

[a] Methylmercury has been retained as a CoPC where present based on past historical use at this site.

Table 4-1. Exposure point concentrations for mercury and lead with and without outlier samples SS-04 and HS-5

	No. of Results	Frequency of Detection	Minimum	Mean	Maximum	95% UCL	EPC
Total Mercury							
Developed Area							
With SS-04	15	100%	9.3	1,562	13,800 *	3,861	3,861 UCL
Without SS-04	14	100%	9.3	688	2,250	1,312	1,312 UCL
Undeveloped Area							
With HS-5	40	100%	0.33	7,486	295,000 *	80,838	80,838 UCL
Without HS-5	39	100%	0.33	113	588	181	181 UCL
Lead							
Undeveloped Area							
With HS-5	32	97%	0.52	2,110	47,600 *	7,718	2,110 Mean
Without HS-5	31	97%	0.52	642	4,320	993	642 Mean

Note: Units are mg/kg

* - outlier concentration
EPC - exposure point concentration
UCL - upper confidence limit

Table 6-1. Summary of total excess lifetime cancer risks for reasonable maximum exposure scenarios

Receptor/Exposure Pathway	Cancer Risk	Percent Contribution by Pathway	Cancer Risk	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Developed Area	**Adult**		**Older Child**		
Long-term Worker - Current					
Outdoor Air	--	--			No carcinogenic CoPCs for air pathway
Total - Outdoor Air:	--				
Surface Soil - unpaved					
Ingestion of Surface Soil	4E-6	11%	NA	--	Arsenic, PAHs
Dermal Contact with Surface Soil	2E-6	7%	NA	--	Arsenic, PAHs
Inhalation of vapors in indoor air (soil)	2E-5	77%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	1E-6	4%	NA	--	Benzene
Total for Commercial Worker:	**3E-5**	100%			
Long-term Worker - Future					
Outdoor Air	--	--			No carcinogenic CoPCs for air pathway
Total - Outdoor Air:	--				
Surface Soil - paved and unpaved					
Ingestion of Surface Soil	3E-6	3%	NA	--	Arsenic, PAHs
Dermal Contact with Surface Soil	3E-6	3%	NA	--	PAHs, arsenic
Inhalation of vapors in indoor air (soil)	2E-5	26%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	1E-6	1%	NA	--	Benzene
Total - Surface Soil:	3E-5				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	6E-5	66%	NA	--	Arsenic, benzene
Dermal Contact with Groundwater	8E-9	0.01%	NA	--	Benzene, arsenic, 1,4-dichlorobenzene
Total - Groundwater:	6E-5				
Total for Commercial Worker:	**9E-5**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	3E-7	94%	NA	--	Arsenic
Dermal Contact with Subsurface Soil	2E-8	6%	NA	--	Arsenic, PCBs
Total for Construction Worker:	**4E-7**	100%			
Undeveloped Area					
Long-term Worker - Future					
Outdoor Air	2E-6	2%			Chromium particulates
Total - Outdoor Air:	2E-6				
Surface Soil					
Ingestion of Surface Soil	1E-5	11%	NA	--	PAHs, arsenic, PCBs
Dermal Contact with Surface Soil	1E-5	16%	NA	--	PAHs, PCBs, arsenic
Inhalation of vapors in indoor air (soil)	2E-6	2%	NA	--	Benzo[a]pyrene, other carcinogenic PAHs
Inhalation of vapors in indoor air (groundwater)	2E-6	2%	NA	--	Benzene
Total - Surface Soil, Indoor Air:	3E-5				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	6E-5	67%	NA	--	Arsenic, benzene
Dermal Contact with Groundwater	8E-9	0.01%	NA	--	Benzene, arsenic, 1,4-dichlorobenzene
Total - Groundwater:	6E-5				
Total for Commercial Worker:	**9E-5**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	4E-6	81%	NA	--	Arsenic, PAHs, PCBs
Dermal Contact with Subsurface Soil	9E-7	19%	NA	--	PAHs, PCBs, arsenic
Total for Construction Worker:	**5E-6**	100%			

Table 6-1. (cont.)

Receptor/Exposure Pathway	Cancer Risk	Percent Contribution by Pathway	Cancer Risk	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Trespassers - Current/Future					
Exposure to Surface Soil					
Ingestion of Surface Soil	1E-5	24%	6E-6	30%	PAHs, arsenic, PCBs
Dermal Contact with Surface Soil	2E-5	43%	7E-6	37%	PAHs, PCBs, arsenic
Total for Trespassers - Surface Soil:	4E-5		1E-5		
Contact with Surface Water and Sediments in OU1					
Ingestion of Sediments	7E-6	13%	3E-6	16%	PAHs, arsenic
Dermal Contact with Sediments	1E-5	20%	3E-6	17%	PAHs, arsenic
Ingestion of Surface Water	0E+0	0%	0E+0	0%	No carcinogens detected
Dermal Contact with Surface Water	0E+0	0%	0E+0	0%	No carcinogens detected
Total for Trespassers - Sediments/ Surface Water:	2E-5		6E-6		
Total for Trespassers - all media:	**5E-5**	100%	**2E-5**	100%	
Hypothetical Future Residential Use of Groundwater					
Ingestion of Groundwater	2E-4	57%	1E-4	60%	Arsenic, benzene
Dermal Contact with Groundwater	5E-6	1.5%	3E-6	1.3%	Benzene, arsenic, 1,4-dichlorobenzene
Inhalation from showering or bathing	2E-4	42%	9E-5	39%	Benzene
Total - Hypothetical Residential Use of Groundwater:	**4E-4**	100%	**2E-4**	100%	

Note: -- - percentage not calculated because pathway is not applicable for a child
NA - not applicable
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl

Table 6-2. Summary of total excess lifetime cancer risks for central tendency exposure scenarios

Receptor/Exposure Pathway	Cancer Risk	Percent Contribution by Pathway	Cancer Risk	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Developed Area	**Adult**		**Older Child**		
Long-term Worker - Current					
Outdoor Air	--	--			No carcinogenic CoPCs for air pathway
Total - Outdoor Air:	--				
Surface Soil - unpaved					
Ingestion of Surface Soil	1E-6	23%	NA	--	Arsenic, PAHs
Dermal Contact with Surface Soil	7E-8	1.5%	NA	--	Arsenic, PAHs
Inhalation of vapors in indoor air (soil)	3E-6	71%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	2E-7	3.8%	NA	--	Benzene
Total for Commercial Worker:	**5E-6**	100%			
Long-term Worker - Future					
Outdoor Air	--				No carcinogenic CoPCs for air pathway
Total - Outdoor Air:	--				
Surface Soil - paved and unpaved					
Ingestion of Surface Soil	9E-7	8%	NA	--	Arsenic, PAHs
Dermal Contact with Surface Soil	8E-8	0.7%	NA	--	PAHs, arsenic
Inhalation of vapors in indoor air (soil)	3E-6	30%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	2E-7	2%	NA	--	Benzene
Total - Surface Soil, Indoor Air:	5E-6				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	7E-6	60%	NA	--	Arsenic, benzene
Dermal Contact with Groundwater	3E-9	0.02%	NA	--	Benzene
Total - Groundwater:	7E-6				
Total for Commercial Worker:	**1E-5**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	2E-8	81%	NA	--	Arsenic
Dermal Contact with Subsurface Soil	5E-9	19%	NA	--	Arsenic, PCBs
Total for Construction Worker:	**3E-8**	100%			
Undeveloped Area					
Long-term Worker - Future					
Outdoor Air	3E-7	2%			Chromium particulates
Total - Outdoor Air:	3E-7				
Surface Soil					
Ingestion of Surface Soil	3E-6	29%	NA	--	PAHs, arsenic, PCBs
Dermal Contact with Surface Soil	4E-7	4%	NA	--	PAHs, PCBs, arsenic
Inhalation of vapors in indoor air (soil)	2E-7	2%	NA	--	Benzo[a]pyrene, other carcinogenic PAHs
Inhalation of vapors in indoor air (groundwater)	3E-7	3%	NA	--	Benzene
Total - Surface Soil, Indoor Air:	4E-6				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	7E-6	60%	NA	--	Arsenic, benzene
Dermal Contact with Groundwater	3E-9	0.02%	NA	--	Benzene
Total - Groundwater:	7E-6				
Total for Commercial Worker:	**1E-5**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	2E-7	57%	NA	--	Arsenic, PAHs, PCBs
Dermal Contact with Subsurface Soil	2E-7	43%	NA	--	PAHs, PCBs, arsenic
Total for Construction Worker:	**4E-7**	100%			

Table 6-2. (cont.)

Receptor/Exposure Pathway	Cancer Risk	Percent Contribution by Pathway	Cancer Risk	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Trespassers - Current/Future					
Exposure to Surface Soil					
Ingestion of Surface Soil	1E-6	58%	1E-6	49%	PAHs, arsenic, PCBs
Dermal Contact with Surface Soil	1E-7	7%	5E-7	16%	PAHs, PCBs, arsenic
Total for Trespassers - Surface Soil:	1E-6		2E-6		
Contact with Surface Water and Sediments in OU1					
Ingestion of Sediments	5E-7	32%	8E-7	27%	PAHs, arsenic
Dermal Contact with Sediments	5E-8	3%	2E-7	8%	PAHs, arsenic
Ingestion of Surface Water	0E+0	0%	0E+0	0%	No carcinogens detected
Dermal Contact with Surface Water	0E+0	0%	0E+0	0%	No carcinogens detected
Total for Trespassers - Sediments/ Surface Water:	6E-7		1E-6		
Total for Trespassers - all media:	**2E-6**	100%	**3E-6**	100%	
Hypothetical Future Residential Use of Groundwater					
Ingestion of Groundwater	4E-5	97%	7E-5	97%	Arsenic, benzene
Dermal Contact with Groundwater	7E-7	2%	1E-6	1%	Benzene, arsenic, 1,4-dichlorobenzene
Inhalation from showering or bathing	8E-7	2%	1E-6	1%	Benzene
Total - Hypothetical Residential Use of Groundwater:	**4E-5**	100%	**7E-5**	100%	

Note: -- - percentage not calculated because pathway is not applicable for a child
NA - not applicable
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl

Table 6-3. Summary of total hazard indices for reasonable maximum exposure scenarios

Receptor/Exposure Pathway	Hazard Index	Percent Contribution by Pathway	Hazard Index	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Developed Area	**Adult**		**Older Child**		
Long-term Worker - Current					
Outdoor Air	0.017				Mercury vapor
Total - Outdoor Air:	0.017	2%			
Surface Soil - unpaved					
Ingestion of Surface Soil	0.56	60%	NA	--	Mercury
Dermal Contact with Surface Soil	0.0071	0.8%	NA	--	Arsenic
Inhalation of vapors in indoor air (soil)	0.29	31%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	0.056	6%	NA	--	Naphthalene, benzene, toluene, xylenes
Total - Surface Soil, Indoor Air:	0.91				
Total for Commercial Worker:	**0.93**	100%			
Long-term Worker - Future					
Outdoor Air	0.017				Mercury vapor
Total - Outdoor Air:	0.017	0.3%			
Surface Soil - paved and unpaved					
Ingestion of Surface Soil	2.3	44%	NA	--	Mercury
Dermal Contact with Surface Soil	0.0040	0.08%	NA	--	Arsenic
Inhalation of vapors in indoor air (soil)	0.29	6%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	0.056	1.1%	NA	--	Naphthalene, benzene, toluene, xylenes
Total - Surface Soil:	2.6				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	2.5	49%	NA	--	Thallium, mercury, manganese, arsenic
Dermal Contact with Groundwater	0.00086	0.02%	NA	--	Manganese, mercury, benzene, cadmium, vanadium
Total - Groundwater:	2.5				
Total for Commercial Worker:	**5.2**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	7.8	100%	NA	--	Mercury
Dermal Contact with Subsurface Soil	0.0056	0.1%	NA	--	PCBs, arsenic
Total for Construction Worker:	**7.8**	100%			
Undeveloped Area					
Long-term Worker - Future					
Outdoor Air	0.022				Mercury vapor
Total - Outdoor Air:	0.022	2%			
Surface Soil					
Ingestion of Surface Soil	1.1	11%	NA	--	Chromium, mercury, PCBs
Dermal Contact with Surface Soil	0.22	2%	NA	--	PCBs
Inhalation of vapors in indoor air (soil)	5.7	60%	NA	--	Napthalene, xylene
Inhalation of vapors in indoor air (groundwater)	0.094	1.0%	NA	--	Naphthalene, benzene, toluene, xylenes
Total - Surface Soil, Indoor Air:	7.1				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	2.5	26%	NA	--	Thallium, mercury, manganese, arsenic
Dermal Contact with Groundwater	0.00086	0.01%	NA	--	Manganese, mercury, benzene, cadmium, vanadium
Total - Groundwater:	2.5				
Total for Commercial Worker:	**9.6**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	2.7	98%	NA	--	Mercury, chromium
Dermal Contact with Subsurface Soil	0.051	2%	NA	--	PCBs
Total for Construction Worker:	**2.8**	100%			

Table 6-3. (cont.)

Receptor/Exposure Pathway	Hazard Index	Percent Contribution by Pathway	Hazard Index	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Trespassers - Current/Future					
Exposure to Surface Soil					
Ingestion of Surface Soil	1.1	29%	1.6	30%	Chromium, mercury, PCBs
Dermal Contact with Surface Soil	0.30	8%	0.30	6%	PCBs
Total for Trespassers - Surface Soil:	1.4		1.9		
Contact with Surface Water and Sediments in OU1					
Ingestion of Sediments	2.3	61%	3.3	63%	Mercury
Dermal Contact with Sediments	0.055	1.4%	0.055	1.0%	PCBs
Ingestion of Surface Water	0.0042	0.1%	0.0060	0.1%	Mercury
Dermal Contact with Surface Water	0.031	0.8%	0.031	0.6%	Mercury, manganese
Total for Trespassers - Sediments/ Surface Water:	2.4		3.4		
Total for Trespassers - all media:	**3.8**	100%	**5.3**	100%	
Hypothetical Future Residential Use of Groundwater					
Ingestion of Groundwater	7.1	30%	25	33%	Thallium, mercury, manganese, arsenic
Dermal Contact with Groundwater	0.48	2.0%	1.4	1.9%	Manganese, mercury, benzene, cadmium, vanadium
Inhalation from showering or bathing	16	68%	49	65%	Naphthalene, benzene, xylene, toluene, 4-methylphenol
Total - Hypothetical Residential Use of Groundwater:	**23**	100%	**75**	100%	

Note: -- - percentage not calculated because pathway is not applicable for a child
NA - not applicable
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl

Table 6-4. Summary of total hazard indices for central tendency exposure scenarios

Receptor/Exposure Pathway	Hazard Index	Percent Contribution by Pathway	Hazard Index	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Developed Area	**Adult**		**Older Child**		
Long-term Worker - Current					
Outdoor Air	0.0059	1%			Mercury vapor
Total - Outdoor Air:	0.0059				
Surface Soil - unpaved					
Ingestion of Surface Soil	0.49	77%	NA	--	Mercury
Dermal Contact with Surface Soil	0.00062	0.10%	NA	--	Arsenic
Inhalation of vapors in indoor air (soil)	0.11	18%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	0.022	3%	NA	--	Naphthalene, benzene, toluene, xylenes
Total for Commercial Worker:	**0.63**	100%			
Long-term Worker - Future					
Outdoor Air	0.0059	0.2%			Mercury vapor
Total - Outdoor Air:	0.0059				
Surface Soil - paved and unpaved					
Ingestion of Surface Soil	2.0	68%	NA	--	Mercury
Dermal Contact with Surface Soil	0.00035	0.01%	NA	--	Arsenic
Inhalation of vapors in indoor air (soil)	0.11	4%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	0.022	0.8%	NA	--	Naphthalene, benzene, toluene, xylenes
Total - Surface Soil, Indoor Air:	2.1				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	0.77	27%	NA	--	Iron, manganese, thallium, mercury, arsenic
Dermal Contact with Groundwater	0.00075	0.03%	NA	--	Manganese, mercury
Total - Groundwater:	0.77				
Total for Commercial Worker:	**2.9**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	0.99	100%	NA	--	Mercury
Dermal Contact with Subsurface Soil	0.0012	0%	NA	--	PCBs, arsenic
Total for Construction Worker:	**0.99**	100%			
Undeveloped Area					
Long-term Worker - Future					
Outdoor Air	0.0076	0.2%			Mercury vapor
Total - Outdoor Air:	0.0076				
Surface Soil					
Ingestion of Surface Soil	0.93	23%	NA	--	Mercury, PCBs
Dermal Contact with Surface Soil	0.019	0.5%	NA	--	PCBs
Inhalation of vapors in indoor air (soil)	2.3	56%	NA	--	PAHs, xylenes
Inhalation of vapors in indoor air (groundwater)	0.037	0.9%	NA	--	Toluene, naphthalene, benzene, xylenes
Total - Surface Soil, Indoor Air:	3.2				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	0.77	19%	NA	--	Iron, manganese, thallium, mercury, arsenic
Dermal Contact with Groundwater	0.00075	0.02%	NA	--	Manganese, mercury
Total - Groundwater:	0.77				
Total for Commercial Worker:	**4.0**	100%			
Construction Worker - Current/Future					
Exposure to Subsurface Soil					
Ingestion of Subsurface Soil	0.34	97%	NA	--	Mercury
Dermal Contact with Subsurface Soil	0.011	3%	NA	--	PCBs
Total for Construction Worker:	**0.35**	100%			

Table 6-4. (cont.)

Receptor/Exposure Pathway	Hazard Index	Percent Contribution by Pathway	Hazard Index	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Trespassers - Current/Future					
Exposure to Surface Soil					
Ingestion of Surface Soil	0.28	32%	0.39	32%	Mercury, PCBs
Dermal Contact with Surface Soil	0.0048	0.6%	0.019	2%	PCBs
Total for Trespassers - Surface Soil:	0.28		0.41		
Contact with Surface Water and Sediments in OU1					
Ingestion of Sediments	0.57	66%	0.82	66%	Mercury
Dermal Contact with Sediments	0.00090	0.1%	0.0036	0.3%	PCBs
Ingestion of Surface Water	0.0010	0.1%	0.0015	0.1%	Mercury
Dermal Contact with Surface Water	0.0077	0.9%	0.0077	0.6%	Mercury, manganese
Total for Trespassers - Sediments/ Surface Water:	0.58		0.83		
Total for Trespassers - all media:	**0.86**	100%	**1.2**	100%	
Hypothetical Future Residential Use of Groundwater					
Ingestion of Groundwater	4.9	91%	1.0	51%	Iron, manganese, thallium, mercury, arsenic
Dermal Contact with Groundwater	0.20	4%	0.46	23%	Manganese, mercury
Inhalation from showering or bathing	0.29	5%	0.53	26%	Naphthalene, benzene, xylene, toluene, 4-methylphenol
Total - Hypothetical Residential Use of Groundwater:	**5.4**	100%	**2.0**	100%	

Note: -- - percentage not calculated because pathway is not applicable for a child
NA - not applicable
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl

Table 6-5. Summary of total hazard indices for reasonable maximum exposure scenarios (including outlier values)

Receptor/Exposure Pathway	Hazard Index	Percent Contribution by Pathway	Hazard Index	Percent Contribution by Pathway	Chemicals with Primary Contribution to Risk for each Pathway
Developed Area	**Adult**		**Older Child**		
Long-term Worker - Future (based on UCL incorporating hot spot value of 13,800 mg/kg with FI of 0.1)					
Outdoor Air	0.017				Mercury vapor
Total - Outdoor Air:	0.017	0.5%			
Surface Soil - paved and unpaved					
Ingestion of Surface Soil	0.76	21%	NA	--	Mercury
Dermal Contact with Surface Soil	0.0040	0.4%	NA	--	Arsenic
Inhalation of vapors in indoor air (soil)	0.29	8%	NA	--	Benzene
Inhalation of vapors in indoor air (groundwater)	0.056	1.5%	NA	--	Toluene, naphthalene, benzene, xylenes
Total - Surface Soil:	1.1				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	2.5	69%	NA	--	Thallium, mercury, manganese, arsenic
Dermal Contact with Groundwater	0.00086	0.02%	NA	--	Manganese, mercury
Total - Groundwater:	2.5				
Total for Commercial Worker:	**3.6**	100%			
Undeveloped Area					
Long-term Worker - Future (based on UCL incorporating hot spot value of 295,000 mg/kg with FI of 0.1)					
Outdoor Air	0.022				Mercury vapor
Total - Outdoor Air:	0.022	0.10%			
Surface Soil					
Ingestion of Surface Soil	14	62%	NA	--	Mercury (hazard index 13 for mercury)
Dermal Contact with Surface Soil	0.22	1.0%	NA	--	PCBs
Inhalation of vapors in indoor air (soil)	5.7	25%	NA	--	Naphthalene, xylenes
Inhalation of vapors in indoor air (groundwater)	0.094	0.4%	NA	--	Toluene, naphthalene, benzene, xylenes
Total - Surface Soil, Indoor Air:	20				
Exposure to Groundwater as Workplace Drinking Water					
Ingestion of Groundwater	2.5	11%	NA	--	Manganese, thallium, mercury, arsenic
Dermal Contact with Groundwater	0.00086	0.004%	NA	--	Manganese, mercury
Total - Groundwater:	2.5				
Total for Commercial Worker:	**23**	100%			
Trespassers - Current/Future (based on UCL incorporating hot spot value of 295,000 mg/kg with FI of 0.1)					
Exposure to Surface Soil					
Ingestion of Surface Soil	15	84%	21	85%	Mercury (hazard index=14 adult; 20 adolescent/pre-adolescent)
Dermal Contact with Surface Soil	0.30	1.7%	0.30	1.2%	PCBs
Total for Trespassers - Surface Soil:	15		21		
Contact with Surface Water and Sediments in OU1					
Ingestion of Sediments	2.3	13%	3.3	13%	Mercury
Dermal Contact with Sediments	0.055	0.31%	0.055	0.22%	PCBs
Ingestion of Surface Water	0.0042	0.024%	0.0060	0.024%	Mercury
Dermal Contact with Surface Water	0.031	0.18%	0.031	0.13%	Mercury, manganese
Total for Trespassers - Sediments/ Surface Water:	2.4		3.4		
Total for Trespassers - all media:	17	100%	25	100%	

Note: -- - percentage not calculated because pathway is not applicable for a child
NA - not applicable
PCB - polychlorinated biphenyl

Table 6-6. Comparison of OU1 soil arsenic concentrations with New Jersey urban coastal plain background

Area	N	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Median Concentration (mg/kg)	90th percentile Concentration (mg/kg)
Developed area (paved and unpaved)	10	0.85 ND	11	5.8	10
Developed area (unpaved only)	3	0.85 ND	11	3.8	8.7
Undeveloped area	32	0.22 ND	26	6.7	12.7
New Jersey urban coastal plain background surface soils (0–6 in.)	91	--	--	5.2	13.6

Source: Sanders (2003).

Note: -- - information not available
ND - not detected

Appendix A

RAGS D Tables

Table 1.
Selection of exposure pathways
Ventron/Velsicol Site OU1

Scenario Timeframe	Onsite Medium (Except as indicated)	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Onsite/ Offsite	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil	Surface soil	Developed area surface soil (unpaved soil only)	Long-term worker	Adult	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in surface soil by workers identified as a potential pathway and evaluated in risk assessment
Current/Future	Soil, sediment, surface water	Soil, sediment, surface water	Soil, sediment, surface water	Resident	Child/Adult	Combined (ingestion, dermal absorption)	Onsite	Qualitative	Residential use evaluated for hypothetical drinking water pathway only due to current and likely future commercial use.
	Offsite soil, water and biota	Offsite soil, groundwater, surface water, sediment and biota	Offsite soil, groundwater, surface water, sediment and biota	Recreational users	Child/adult	Combined (ingestion, dermal absorption and inhalation)	Offsite	Qualitative	Potential for migration of CoPCs to offsite media and evaluation of exposure to CoPCs, if any, in offsite media will be evaluated as part of the OU2 investigation.
	Combined (soil and groundwater)	Air	Indoor air (developed and undeveloped areas)	Long-term worker	Adult	Inhalation	Onsite	Quantitative	Inhalation of contaminants inside of buildings that have migrated from soil and groundwater
	Soil	Air	Outdoor air (developed and undeveloped areas); indoor air (developed area)	Long-term worker	Adult	Inhalation	Onsite	Quantitative	Contact with CoPCs in air by workers identified as a potential pathway and evaluated in risk assessment. Quantified based on mercury data and qualitatively evaluated for remaining CoPCs.
		Surface soil	Undeveloped area surface soil	Trespasser/ Visitor	Adult/ Adolescents/ Pre-Adolescents	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in surface soil by trespassers identified as a potential pathway and evaluated in risk assessment
		Subsurface soil	Developed and undeveloped areas subsurface soil (1-20 ft depths)	Construction worker	Adult	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in subsurface soil by construction workers identified as a potential pathway and evaluated in risk assessment
	Sediment	Sediment	Undeveloped area surface sediment[a]	Trespasser/ Visitor	Adult/ Adolescents/ Pre-Adolescents	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in sediments by trespassers identified as a potential pathway and evaluated in risk assessment
	Surface Water	Surface Water	Undeveloped area surface water[a]	Trespasser/ Visitor	Adult/ Adolescents/ Pre-Adolescents	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in OU1 surface water by trespassers identified as a potential pathway and evaluated in risk assessment
Future	Soil	Surface soil	Developed area surface soil (all)	Long-term worker	Adult	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in surface soil by workers identified as a potential pathway and evaluated in risk assessment
		Surface soil	Undeveloped area surface soil	Long-term worker	Adult	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Contact with CoPCs in surface soil by workers identified as a potential pathway and evaluated in risk assessment
	Groundwater	Groundwater	Groundwater sitewide	Long-term worker	Adult	Combined (ingestion and dermal absorption)	Onsite	Quantitative	Use of groundwater as workplace drinking water identified as a potential pathway and evaluated in risk assessment
		Groundwater	Groundwater sitewide, indoor air (bathroom)	Future hypothetical resident	Child/Adult	Combined (ingestion, dermal absorption and inhalation)	Onsite	Quantitative	Residential use of groundwater as drinking water evaluated in hypothetical scenario because site groundwater is designated as a potable aquifer.

Note: OU1 - Operable Unit 1 CoPC - contaminants of potential concern

[a] Surface water and sediments addressed are from West Ditch and the onsite basin.

Table 2.1
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current
Medium:	Soil
Exposure Medium:	Surface soil
Exposure Point:	Developed Area surface soil

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES																
7440-36-0	Antimony	–		–		mg/kg		0/3	0.76–0.97	ND	<6	3.1	N	14	SCC	No	IFD
7440-38-2	Arsenic	5.8		11		mg/kg	SS-14	2/3	0.85–0.85	11	13.6	0.39	C	20	SCC	Yes	ASL
7440-39-3	Barium	26.9	J	190		mg/kg	SS-14	3/3	–	190	65.8	540	N	700	SCC	No	BSL
7440-41-7	Beryllium	0.68		0.68		mg/kg	SS-14	1/3	0.26–0.52	0.68	0.68	15	N	2.0	SCC	No	BSL
7440-43-9	Cadmium	0.97	J	3.1	J	mg/kg	SS-16	2/3	0.047–0.047	3.1	<0.5	3.7	N	39	SCC	No	BSL
7440-70-2	Calcium	900	J	31000		mg/kg	SS-14	3/3	–	31000	2000	N/A		--		No	NTX
7440-47-3	Chromium	6.7	J	96.9	J	mg/kg	SS-16	3/3	–	96.9	34.7	22	N[c]	240	SCC	**Yes**	ASL
7440-48-4	Cobalt	2.6		12.6		mg/kg	SS-16	3/3	–	12.6	<5	140	N	--		No	BSL
7440-50-8	Copper	18.5	J	470	J	mg/kg	SS-14	3/3	–	470	33.3	310	N	600	SCC	**Yes**	ASL
7439-92-1	Lead	17.8	J	390		mg/kg	SS-14	3/3	–	390	144	400	N	400	SCC	No	BSL
7439-95-4	Magnesium	771	J	11000		mg/kg	SS-16	3/3	–	11000	1870	N/A		--		No	NTX
7439-96-5	Manganese	126	J	540	J	mg/kg	SS-14	3/3	–	540	206	180	N	--		**Yes**	ASL
7439-97-6	Mercury	9.3		310		mg/kg	SS-14	3/3	–	310	0.21	0.61	N[d]	14	SCC	**Yes**	ASL
7440-02-0	Nickel	4.7	J	72.2	J	mg/kg	SS-14	3/3	–	72.2	12.3	160	N	250	SCC	No	BSL
7440-09-7	Potassium	238		1500		mg/kg	SS-14	3/3	–	1500	1750	N/A		--		No	NTX
7782-49-2	Selenium	0.69		0.69		mg/kg	SS-16	1/3	0.54–1.6	0.69	<1	39	N	63	SCC	No	BSL
7440-22-4	Silver	–		–		mg/kg		0/3	0.41–1.9	ND	<1	39	N	110	SCC	No	IFD
7440-23-5	Sodium	630		630		mg/kg	SS-16	1/3	270–290	630	<500	N/A		--		No	NTX
7440-28-0	Thallium	–		–		mg/kg		0/3	0.86–3.9	ND	<1	0.52	N	2.0	SCC	No	IFD
7440-62-2	Vanadium	6		140		mg/kg	SS-14	3/3	–	140	35.5	7.8	N	370	SCC	**Yes**	ASL
7440-66-6	Zinc	89	J	1100		mg/kg	SS-14	3/3	–	1100	106	2300	N	1,500	SCC	No	BSL
	ORGANIC ANALYTES																
120-82-1	1,2,4-Trichlorobenzene	–		–		µg/kg		0/3	370–480	ND		6200	N	68,000	SCC	No	IFD
95-50-1	1,2-Dichlorobenzene	–		–		µg/kg		0/3	370–480	ND		110000	N	5,100,000	SCC	No	IFD
541-73-1	1,3-Dichlorobenzene	–		–		µg/kg		0/3	370–480	ND		53000	N	5,100,000	SCC	No	IFD
106-46-7	1,4-Dichlorobenzene	–		–		µg/kg		0/3	370–480	ND		3400	C	570,000	SCC	No	IFD
108-60-1	2,2'-Oxybis[1-chloropropane]	–		–		µg/kg		0/3	370–480	ND		2900	C	--		No	IFD
95-95-4	2,4,5-Trichlorophenol	–		–		µg/kg		0/3	930–1200	ND		610000	N	5,600,000	SCC	No	IFD
88-06-2	2,4,6-Trichlorophenol	–		–		µg/kg		0/3	370–480	ND		610	N	62,000	SCC	No	IFD
120-83-2	2,4-Dichlorophenol	–		–		µg/kg		0/3	370–480	ND		18000	N	170,000	SCC	No	IFD
105-67-9	2,4-Dimethylphenol	–		–		µg/kg		0/3	370–480	ND		120000	N	1,100,000	SCC	No	IFD
51-28-5	2,4-Dinitrophenol	–		–		µg/kg		0/3	930–1200	ND		12000	N	110,000	SCC	No	IFD
121-14-2	2,4-Dinitrotoluene	–		–		µg/kg		0/3	370–480	ND		12000	N	--		No	IFD
606-20-2	2,6-Dinitrotoluene	–		–		µg/kg		0/3	370–480	ND		6100	N	--		No	IFD
91-58-7	2-Chloronaphthalene	–		–		µg/kg		0/3	370–480	ND		490000	N	--		No	IFD
95-57-8	2-Chlorophenol	–		–		µg/kg		0/3	370–480	ND		6300	N	280,000	SCC	No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol	–		–		µg/kg		0/3	930–1200	ND		610	N	--		No	IFD
95-48-7	2-Methylphenol	–		–		µg/kg		0/3	370–480	ND		310000	N	2,800,000	SCC	No	IFD
88-74-4	2-Nitroaniline	–		–		µg/kg		0/3	930–1200	ND		18000	N	--		No	IFD
88-75-5	2-Nitrophenol	–		–		µg/kg		0/3	370–480	ND		N/A	N	--		No	IFD
91-94-1	3,3'-Dichlorobenzidine	–		–		µg/kg		0/3	370–480	ND		1100	C	2,000	SCC	No	IFD
99-09-2	3-Nitroaniline	–		–		µg/kg		0/3	930–1200	ND		1800	N	--		No	IFD
101-55-3	4-Bromophenyl-phenyl ether	–		–		µg/kg		0/3	370–480	ND		N/A		--		No	IFD
59-50-7	4-Chloro-3-methylphenol	–		–		µg/kg		0/3	370–480	ND		N/A		10,000,000	SCC	No	IFD
106-47-8	4-Chloroaniline	–		–		µg/kg		0/3	370–480	ND		24000	N	230,000	SCC	No	IFD

Table 2.1
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
7005-72-3	4-Chlorophenyl-phenyl ether	–		–		µg/kg		0/3	370–480	ND		N/A		--		No	IFD
106-44-5	4-Methylphenol	–		–		µg/kg		0/3	370–480	ND		31000	N	2,800,000	SCC	No	IFD
100-01-6	4-Nitroaniline	–		–		µg/kg		0/3	930–1200	ND		18000	N	--		No	IFD
100-02-7	4-Nitrophenol	–		–		µg/kg		0/3	930–1200	ND		N/A		--		No	IFD
111-91-1	bis[2-chloroethoxy]methane	–		–		µg/kg		0/3	370–480	ND		N/A		--		No	IFD
111-44-4	bis[2-chloroethyl]ether	–		–		µg/kg		0/3	370–480	ND		220	C	660	SCC	No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	1600		8600		µg/kg	SS-16	2/3	400–400	8600		35000	C	49,000	SCC	No	BSL
85-68-7	Butylbenzyl phthalate	150		150		µg/kg	SS-16	1/3	370–400	150		1200000	N	1,100,000	SCC	No	BSL
86-74-8	Carbazole	–		–		µg/kg		0/3	370–480	ND		24000	C	--		No	IFD
132-64-9	Dibenzofuran	–		–		µg/kg		0/3	370–480	ND		15000	N	--		No	IFD
84-66-2	Diethyl phthalate	–		–		µg/kg		0/3	370–480	ND		4900000	N	10,000,000	SCC	No	IFD
131-11-3	Dimethyl phthalate	–		–		µg/kg		0/3	370–480	ND		61000000	N	10,000,000	SCC	No	IFD
84-74-2	Di-n-butyl phthalate	1000		1000		µg/kg	SS-16	1/3	370–400	1000		610000	N	5,700,000	SCC	No	BSL
117-84-0	Di-n-octyl phthalate	–		–		µg/kg		0/3	370–480	ND		240000	N	1,100,000	SCC	No	IFD
118-74-1	Hexachlorobenzene	–		–		µg/kg		0/3	370–480	ND		300	C	660	SCC	No	IFD
87-68-3	Hexachlorobutadiene	–		–		µg/kg		0/3	370–480	ND		1800	N	1,000	SCC	No	IFD
77-47-4	Hexachlorocyclopentadiene	–		–		µg/kg		0/3	370–480	ND		37000	N	400,000	SCC	No	IFD
67-72-1	Hexachloroethane	–		–		µg/kg		0/3	370–480	ND		6100	N	6,000	SCC	No	IFD
78-59-1	Isophorone	–		–		µg/kg		0/3	370–480	ND		510000	C	1,100,000	SCC	No	IFD
98-95-3	Nitrobenzene	–		–		µg/kg		0/3	370–480	ND		2000	N	28,000	SCC	No	IFD
621-64-7	N-nitroso-di-n-propylamine	–		–		µg/kg		0/3	370–480	ND		69	C	660	SCC	No	IFD
86-30-6	N-nitrosodiphenylamine	–		–		µg/kg		0/3	370–480	ND		99000	C	140,000	SCC	No	IFD
87-86-5	Pentachlorophenol	–		–		µg/kg		0/3	930–1200	ND		3000	C	6,000	SCC	No	IFD
108-95-2	Phenol	–		–		µg/kg		0/3	370–480	ND		1800000	N	10,000,000	SCC	No	IFD
71-55-6	1,1,1-Trichloroethane	–		–		µg/kg		0/3	11–14	ND		200000	N	210,000	SCC	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane	–		–		µg/kg		0/3	11–14	ND		410	C	34,000	SCC	No	IFD
79-00-5	1,1,2-Trichloroethane	–		–		µg/kg		0/3	11–14	ND		730	C	22,000	SCC	No	IFD
75-34-3	1,1-Dichloroethane	–		–		µg/kg		0/3	11–14	ND		51000	N	570,000	SCC	No	IFD
75-35-4	1,1-Dichloroethene	–		–		µg/kg		0/3	11–14	ND		12400	N	8,000	SCC	No	IFD
107-06-2	1,2-Dichloroethane	–		–		µg/kg		0/3	11–14	ND		280	C	6,000	SCC	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)	–		–		µg/kg		0/3	11–14	ND		4300	N[e]	--		No	IFD
78-87-5	1,2-Dichloropropane	–		–		µg/kg		0/3	11–14	ND		340	C	10,000	SCC	No	IFD
78-93-3	2-Butanone	–		–		µg/kg		0/3	11–14	ND		2200000	N	1,000,000	SCC	No	IFD
591-78-6	2-Hexanone	–		–		µg/kg		0/3	11–14	ND		N/A		--		No	IFD
108-10-1	4-Methyl-2-pentanone	–		–		µg/kg		0/3	11–14	ND		530000	N	1,000,000	SCC	No	IFD
67-64-1	Acetone	8	*J*	8	*J*	µg/kg	SS-15	1/3	12–14	8		1400000	N	1,000,000	SCC	No	BSL
71-43-2	Benzene	–		–		µg/kg		0/3	11–14	ND		640	C	3,000	SCC	No	IFD
75-27-4	Bromodichloromethane	–		–		µg/kg		0/3	11–14	ND		820	C	11,000	SCC	No	IFD
75-25-2	Bromoform	–		–		µg/kg		0/3	11–14	ND		62000	C	86,000	SCC	No	IFD
74-83-9	Bromomethane	–		–		µg/kg		0/3	11–14	ND		390	N	79,000	SCC	No	IFD
75-15-0	Carbon disulfide	–		–		µg/kg		0/3	11–14	ND		36000	N	--		No	IFD
56-23-5	Carbon tetrachloride	–		–		µg/kg		0/3	11–14	ND		210	N	2,000	SCC	No	IFD
108-90-7	Chlorobenzene	–		–		µg/kg		0/3	11–14	ND		15000	N	37,000	SCC	No	IFD
67-66-3	Chloroform	–		–		µg/kg		0/3	11–14	ND		220	C	19,000	SCC	No	IFD
74-87-3	Chloromethane	–		–		µg/kg		0/3	11–14	ND		4700	N	520,000	SCC	No	IFD
10061-01-5	cis-1,3-Dichloropropene	–		–		µg/kg		0/3	11–14	ND		780	C	--		No	IFD
124-48-1	Dibromochloromethane	–		–		µg/kg		0/3	11–14	ND		1100	C	110,000	SCC	No	IFD
100-41-4	Ethylbenzene	–		–		µg/kg		0/3	11–14	ND		190000	N	1,000,000	SCC	No	IFD
75-09-2	Methylene chloride	–		–		µg/kg		0/3	11–14	ND		9100	C	49,000	SCC	No	IFD
100-42-5	Styrene	–		–		µg/kg		0/3	11–14	ND		440000	N	23,000	SCC	No	IFD
127-18-4	Tetrachloroethene	–		–		µg/kg		0/3	11–14	ND		480	C	4,000	SCC	No	IFD
108-88-3	Toluene	–		–		µg/kg		0/3	11–14	ND		66000	N	1,000,000	SCC	No	IFD

Table 2.1
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
10061-02-6	trans-1,3-Dichloropropene	–		–		µg/kg		0/3	11–14	ND		780	C	--		No	IFD
79-01-6	Trichloroethene	–		–		µg/kg		0/3	11–14	ND		53	C	23,000	SCC	No	IFD
75-01-4	Vinyl chloride	–		–		µg/kg		0/3	11–14	ND		79	C	2,000	SCC	No	IFD
1330-20-7	Xylene isomers (total)	–		–		µg/kg		0/3	11–14	ND		27000	N	410,000	SCC	No	IFD
	PAHs																
91-57-6	2-Methylnaphthalene	79		79		µg/kg	SS-16	1/3	370–400	79		5600	N[f]	--		No	BSL
83-32-9	Acenaphthene	230		230		µg/kg	SS-14	1/3	370–480	230		370000	N	3,400,000	SCC	No	BSL
208-96-8	Acenaphthylene	53		53		µg/kg	SS-16	1/3	370–400	53		5600	N[f]	--		No	BSL
120-12-7	Anthracene	85		85		µg/kg	SS-16	1/3	370–400	85		2200000	N	10,000,000	SCC	No	BSL
56-55-3	Benz[a]anthracene	310		310		µg/kg	SS-16	1/3	370–400	310		620	C	900	SCC	No	BSL
50-32-8	Benzo[a]pyrene	410		410		µg/kg	SS-16	1/3	370–400	410		62	C	660	SCC	**Yes**	ASL
205-99-2	Benzo[b]fluoranthene	73		750		µg/kg	SS-16	2/3	370–370	750		620	C	900	SCC	**Yes**	ASL
191-24-2	Benzo[ghi]perylene	300		300		µg/kg	SS-16	1/3	370–400	300		5600	N[f]	--		No	BSL
207-08-9	Benzo[k]fluoranthene	210		220		µg/kg	SS-16	2/3	400–400	220		6200	C	900	SCC	No	BSL
218-01-9	Chrysene	56		400		µg/kg	SS-16	2/3	370–370	400		62000	C	9,000	SCC	No	BSL
53-70-3	Dibenz[a,h]anthracene	71		71		µg/kg	SS-16	1/3	370–400	71		62	C	660	SCC	**Yes**	ASL
206-44-0	Fluoranthene	94		570		µg/kg	SS-16	3/3	–	570		230000	N	2,300,000	SCC	No	BSL
86-73-7	Fluorene	370		370		µg/kg	SS-14	1/3	370–480	370		270000	N	2,300,000	SCC	No	BSL
193-39-5	Indeno[1,2,3-cd]pyrene	270		270		µg/kg	SS-16	1/3	370–400	270		620	C	900	SCC	No	BSL
91-20-3	Naphthalene	92		92		µg/kg	SS-16	1/3	370–400	92		5600	N	230,000	SCC	No	BSL
85-01-8	Phenanthrene	270		270		µg/kg	SS-16	1/3	370–400	270		230000	N[g]	--		No	BSL
129-00-0	Pyrene	43		530		µg/kg	SS-16	3/3	–	530		230000	N	1,700,000	SCC	No	BSL

Note: All results reported as dry weight.
For the purposes of screening, field replicates have been averaged.

-- - Soil cleanup criteria not available
– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
PAH - polycyclic aromatic hydrocarbon
PRG - preliminary remediation goal
Q - qualifier
SCC - New Jersey soil cleanup criteria as revised May 12, 1999, based on a combination of Tables 3-2 and 7-1 from the Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D.
TBC - to be considered

Rationale Codes:
Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically
Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Background values are from Sanders (2003) Table 1 - Ambient concentration of extractable metals measured in 248 New Jersey soil samples. The background values used are those for the 90th percentile (mg/kg) for the urban coastal plain.

[b] Screening toxicity values for soil are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.

[c] This default non-carcinogenic screening value for chromium is that for chromium(VI).

[d] This default non-carcinogenic screening value for mercury is that for methylmercury.

[e] This default non-carcinogenic screening value is that for *cis* -1,2-dichloroethene.

[f] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.

[g] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.2
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Surface soil
Exposure Point:	Developed Area surface soil

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES																
7440-36-0	Antimony	-		-		mg/kg		0/12	0.69- 6.7	ND	<6	3.1	N	14	SCC	No	IFD
7440-38-2	Arsenic	2.7	J	11		mg/kg	SS-14	7/10	0.85- 3.4	11	13.6	0.39	C	20	SCC	**Yes**	ASL
7440-39-3	Barium	26.9	J	304		mg/kg	MW-15	10/10	-	304	65.8	540	N	700	SCC	No	BSL
7440-41-7	Beryllium	0.68		0.68		mg/kg	SS-14	1/9	0.26- 0.52	0.68	0.68	15	N	2.0	SCC	No	BSL
7440-43-9	Cadmium	0.22	J	3.4		mg/kg	MW-15	7/13	0.047- 0.54	3.4	<0.5	3.7	N	39	SCC	No	BSL
7440-70-2	Calcium	900	J	31000		mg/kg	SS-14	9/9	-	31000	2000	N/A		--		No	NTX
7440-47-3	Chromium	6.6	J	131		mg/kg	MW-15	10/10	-	131	34.7	22	N[c]	240	SCC	**Yes**	ASL
7440-48-4	Cobalt	2.6		12.6		mg/kg	SS-16	9/9	-	12.6	<5	140	N	--		No	BSL
7440-50-8	Copper	12.4	J	7420		mg/kg	MW-15	13/13	-	7420	33.3	310	N	600	SCC	**Yes**	ASL
7439-92-1	Lead	17.8	J	390		mg/kg	SS-14	13/13	-	390	144	400	N	400	SCC	No	BSL
7439-95-4	Magnesium	771	J	11000		mg/kg	SS-16	9/9	-	11000	1870	N/A		--		No	NTX
7439-96-5	Manganese	110	J	540	J	mg/kg	SS-14	10/10	-	540	206	180	N	--		**Yes**	ASL
7439-97-6	Mercury	9.3		13800		mg/kg	SS-04	15/15	-	13800	0.21	0.61	N[d]	14	SCC	**Yes**	ASL
7440-02-0	Nickel	4.7	J	87.8		mg/kg	MW-15	8/10	7.5- 11.6	87.8	12.3	160	N	250	SCC	No	BSL
7440-09-7	Potassium	238		1500		mg/kg	SS-14	9/9	-	1500	1750	N/A		--		No	NTX
7782-49-2	Selenium	0.69		1.1		mg/kg	MW-15	2/10	0.49- 1.6	1.1	<1	39	N	63	SCC	No	BSL
7440-22-4	Silver	0.56	J	9.6		mg/kg	MW-15	6/10	0.4- 1.9	9.6	<1	39	N	110	SCC	No	BSL
7440-23-5	Sodium	630		630		mg/kg	SS-16	1/9	250- 290	630	<500	N/A		--		No	NTX
7440-28-0	Thallium	1.2		5.4		mg/kg	MW-15	2/13	0.83- 3.9	5.4	<1	0.52	N	2.0	SCC	**Yes**	ASL
7440-62-2	Vanadium	6		140		mg/kg	SS-14	9/9	-	140	35.5	7.8	N	370	SCC	**Yes**	ASL
7440-66-6	Zinc	89	J	2110		mg/kg	MW-15	13/13	-	2110	106	2300	N	1,500	SCC	No	BSL
	ORGANIC ANALYTES																
120-82-1	1,2,4-Trichlorobenzene	-		-		µg/kg		0/9	340- 720	ND		6200	N	68,000	SCC	No	IFD
95-50-1	1,2-Dichlorobenzene	-		-		µg/kg		0/9	340- 720	ND		110000	N	5,100,000	SCC	No	IFD
541-73-1	1,3-Dichlorobenzene	-		-		µg/kg		0/9	340- 720	ND		53000	N	5,100,000	SCC	No	IFD
106-46-7	1,4-Dichlorobenzene	-		-		µg/kg		0/9	340- 720	ND		3400	C	570,000	SCC	No	IFD
108-60-1	2,2'-Oxybis[1-chloropropane]	-		-		µg/kg		0/9	340- 720	ND		2900	C	--		No	IFD
95-95-4	2,4,5-Trichlorophenol	-		-		µg/kg		0/9	860- 1800	ND		610000	N	5,600,000	SCC	No	IFD
88-06-2	2,4,6-Trichlorophenol	-		-		µg/kg		0/9	340- 720	ND		610	N	62,000	SCC	No	IFD
120-83-2	2,4-Dichlorophenol	-		-		µg/kg		0/9	340- 720	ND		18000	N	170,000	SCC	No	IFD
105-67-9	2,4-Dimethylphenol	-		-		µg/kg		0/9	340- 720	ND		120000	N	1,100,000	SCC	No	IFD
51-28-5	2,4-Dinitrophenol	-		-		µg/kg		0/9	860- 1800	ND		12000	N	110,000	SCC	No	IFD
121-14-2	2,4-Dinitrotoluene	-		-		µg/kg		0/9	340- 720	ND		12000	N	--		No	IFD
606-20-2	2,6-Dinitrotoluene	-		-		µg/kg		0/9	340- 720	ND		6100	N	--		No	IFD
91-58-7	2-Chloronaphthalene	-		-		µg/kg		0/9	340- 720	ND		490000	N	--		No	IFD
95-57-8	2-Chlorophenol	-		-		µg/kg		0/9	340- 720	ND		6300	N	280,000	SCC	No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol	-		-		µg/kg		0/9	860- 1800	ND		610	N	--		No	IFD
95-48-7	2-Methylphenol	-		-		µg/kg		0/9	340- 720	ND		310000	N	2,800,000	SCC	No	IFD
88-74-4	2-Nitroaniline	-		-		µg/kg		0/9	860- 1800	ND		18000	N	--		No	IFD
88-75-5	2-Nitrophenol	-		-		µg/kg		0/9	340- 720	ND		N/A	N	--		No	IFD
91-94-1	3,3'-Dichlorobenzidine	-		-		µg/kg		0/9	340- 720	ND		1100	C	2,000	SCC	No	IFD
99-09-2	3-Nitroaniline	-		-		µg/kg		0/9	860- 1800	ND		1800	N	--		No	IFD
101-55-3	4-Bromophenyl-phenyl ether	-		-		µg/kg		0/9	340- 720	ND		N/A		--		No	IFD
59-50-7	4-Chloro-3-methylphenol	-		-		µg/kg		0/9	340- 720	ND		N/A		10,000,000	SCC	No	IFD

Table 2.2
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
106-47-8	4-Chloroaniline	-		-		µg/kg		0/9	340- 720	ND		24000	N	230,000	SCC	No	IFD
7005-72-3	4-Chlorophenyl-phenyl ether	-		-		µg/kg		0/9	340- 720	ND		N/A		--		No	IFD
106-44-5	4-Methylphenol	-		-		µg/kg		0/9	340- 720	ND		31000	N	2,800,000	SCC	No	IFD
100-01-6	4-Nitroaniline	-		-		µg/kg		0/9	860- 1800	ND		18000	N	--		No	IFD
100-02-7	4-Nitrophenol	-		-		µg/kg		0/9	860- 1800	ND		N/A		--		No	IFD
111-91-1	bis[2-chloroethoxy]methane	-		-		µg/kg		0/9	340- 720	ND		N/A		--		No	IFD
111-44-4	bis[2-chloroethyl]ether	-		-		µg/kg		0/9	340- 720	ND		220	C	660	SCC	No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	310		10800		µg/kg	WS-19	11/12	400- 400	10800		35000	C	49,000	SCC	No	BSL
85-68-7	Butylbenzyl phthalate	150		150		µg/kg	SS-16	1/9	340- 720	150		1200000	N	1,100,000	SCC	No	BSL
86-74-8	Carbazole	72		72		µg/kg	SS-03	1/9	360- 720	72		24000	C	--		No	BSL
132-64-9	Dibenzofuran	80		80		µg/kg	SS-03	1/9	360- 720	80		15000	N	--		No	BSL
84-66-2	Diethyl phthalate	-		-		µg/kg		0/9	340- 720	ND		4900000	N	10,000,000	SCC	No	IFD
131-11-3	Dimethyl phthalate	-		-		µg/kg		0/9	340- 720	ND		6.1E+07	N	10,000,000	SCC	No	IFD
84-74-2	Di-n-butyl phthalate	1000		1000		µg/kg	SS-16	1/9	340- 720	1000		610000	N	5,700,000	SCC	No	BSL
117-84-0	Di-n-octyl phthalate	-		-		µg/kg		0/9	340- 720	ND		240000	N	1,100,000	SCC	No	IFD
118-74-1	Hexachlorobenzene	-		-		µg/kg		0/9	340- 720	ND		300	C	660	SCC	No	IFD
87-68-3	Hexachlorobutadiene	-		-		µg/kg		0/9	340- 720	ND		1800	N	1,000	SCC	No	IFD
77-47-4	Hexachlorocyclopentadiene	-		-		µg/kg		0/9	340- 720	ND		37000	N	400,000	SCC	No	IFD
67-72-1	Hexachloroethane	-		-		µg/kg		0/9	340- 720	ND		6100	N	6,000	SCC	No	IFD
78-59-1	Isophorone	-		-		µg/kg		0/9	340- 720	ND		510000	C	1,100,000	SCC	No	IFD
98-95-3	Nitrobenzene	-		-		µg/kg		0/9	340- 720	ND		2000	N	28,000	SCC	No	IFD
621-64-7	N-nitroso-di-n-propylamine	-		-		µg/kg		0/9	340- 720	ND		69	C	660	SCC	No	IFD
86-30-6	N-nitrosodiphenylamine	51		51		µg/kg	SS-03	1/9	360- 720	51		99000	C	140,000	SCC	No	BSL
87-86-5	Pentachlorophenol	-		-		µg/kg		0/9	860- 1800	ND		3000	C	6,000	SCC	No	IFD
108-95-2	Phenol	150		150		µg/kg	SS-05	1/9	340- 480	150		1800000	N	10,000,000	SCC	No	BSL
71-55-6	1,1,1-Trichloroethane	-		-		µg/kg		0/9	10- 14	ND		200000	N	210,000	SCC	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane	-		-		µg/kg		0/9	10- 14	ND		410	C	34,000	SCC	No	IFD
79-00-5	1,1,2-Trichloroethane	-		-		µg/kg		0/9	10- 14	ND		730	C	22,000	SCC	No	IFD
75-34-3	1,1-Dichloroethane	-		-		µg/kg		0/9	10- 14	ND		51000	N	570,000	SCC	No	IFD
75-35-4	1,1-Dichloroethene	-		-		µg/kg		0/9	10- 14	ND		12400	N	8,000	SCC	No	IFD
107-06-2	1,2-Dichloroethane	-		-		µg/kg		0/9	10- 14	ND		280	C	6,000	SCC	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)	-		-		µg/kg		0/9	10- 14	ND		4300	N [€]	--	SCC	No	IFD
78-87-5	1,2-Dichloropropane	-		-		µg/kg		0/9	10- 14	ND		340	C	10,000	SCC	No	IFD
78-93-3	2-Butanone	5	*J*	7	*J*	µg/kg	SS-05	2/9	11- 14	7		2200000	N	1,000,000	SCC	No	BSL
591-78-6	2-Hexanone	-		-		µg/kg		0/9	10- 14	ND		N/A		--		No	IFD
108-10-1	4-Methyl-2-pentanone	-		-		µg/kg		0/9	10- 14	ND		530000	N	1,000,000	SCC	No	IFD
67-64-1	Acetone	8	*J*	8	*J*	µg/kg	SS-15	1/9	4- 35	8		1400000	N	1,000,000	SCC	No	BSL
71-43-2	Benzene	5		2800	*J*	µg/kg	MW-15	4/10	11- 14	2800		640	C	3,000	SCC	**Yes**	ASL
75-27-4	Bromodichloromethane	-		-		µg/kg		0/9	10- 14	ND		820	C	11,000	SCC	No	IFD
75-25-2	Bromoform	-		-		µg/kg		0/9	10- 14	ND		62000	C	86,000	SCC	No	IFD
74-83-9	Bromomethane	-		-		µg/kg		0/9	10- 14	ND		390	N	79,000	SCC	No	IFD
75-15-0	Carbon disulfide	-		-		µg/kg		0/9	10- 14	ND		36000	N	--		No	IFD
56-23-5	Carbon tetrachloride	-		-		µg/kg		0/9	10- 14	ND		210	N	2,000	SCC	No	IFD
108-90-7	Chlorobenzene	1.2	*J*	1.2	*J*	µg/kg	MW-15	1/10	10- 14	1.2		15000	N	37,000	SCC	No	BSL
67-66-3	Chloroform	-		-		µg/kg		0/9	10- 14	ND		220	C	19,000	SCC	No	IFD
74-87-3	Chloromethane	-		-		µg/kg		0/9	10- 14	ND		4700	N	520,000	SCC	No	IFD
10061-01-5	cis-1,3-Dichloropropene	-		-		µg/kg		0/9	10- 14	ND		780	C	--		No	IFD
124-48-1	Dibromochloromethane	-		-		µg/kg		0/9	10- 14	ND		1100	C	110,000	SCC	No	IFD
100-41-4	Ethylbenzene	-		-		µg/kg		0/9	10- 14	ND		190000	N	1,000,000	SCC	No	IFD
136777-61-2	meta & para Xylenes	17	*J*	17	*J*	µg/kg	MW-15	1/1	-	17		27000	N	--		No	NTX
75-09-2	Methylene chloride	-		-		µg/kg		0/9	3- 14	ND		9100	C	49,000	SCC	No	IFD

Table 2.2
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
95-47-6	ortho-Xylene	20	J	20	J	µg/kg	MW-15	1/1	-	20		27000	N	--	SCC	No	NTX
100-42-5	Styrene	-		-		µg/kg		0/9	10- 14	ND		440000	N	23,000	SCC	No	IFD
127-18-4	Tetrachloroethene	-		-		µg/kg		0/9	10- 14	ND		480	C	4,000	SCC	No	IFD
108-88-3	Toluene	11	J	11	J	µg/kg	MW-15	1/10	10- 14	11		66000	N	1,000,000	SCC	No	BSL
10061-02-6	trans-1,3-Dichloropropene	-		-		µg/kg		0/9	10- 14	ND		780	C	--		No	IFD
79-01-6	Trichloroethene	2		2		µg/kg	SS-04	1/9	10- 14	2		53	C	23,000	SCC	No	BSL
75-01-4	Vinyl chloride	-		-		µg/kg		0/9	10- 14	ND		79	C	2,000	SCC	No	IFD
1330-20-7	Xylene isomers (total)	-		-		µg/kg		0/9	10- 14	ND		27000	N	410,000	SCC	No	IFD
	PAHs																
91-57-6	2-Methylnaphthalene	60		190		µg/kg	SS-03	3/9	360- 720	190		5600	N[f]	--		No	BSL
83-32-9	Acenaphthene	40		230		µg/kg	SS-14	6/9	360- 480	230		370000	N	3,400,000	SCC	No	BSL
208-96-8	Acenaphthylene	53		69		µg/kg	SS-03	2/9	360- 720	69		5600	N[f]	--		No	BSL
120-12-7	Anthracene	40		460		µg/kg	SS-03	7/9	370- 400	460		2200000	N	10,000,000	SCC	No	BSL
56-55-3	Benz[a]anthracene	150		1400		µg/kg	SS-03	10/12	370- 400	1400		620	C	900	SCC	**Yes**	ASL
50-32-8	Benzo[a]pyrene	120		1100		µg/kg	SS-03	10/12	370- 400	1100		62	C	660	SCC	**Yes**	ASL
205-99-2	Benzo[b]fluoranthene	73		1400		µg/kg	SS-03	11/12	370- 370	1400		620	C	900	SCC	**Yes**	ASL
191-24-2	Benzo[ghi]perylene	96		520		µg/kg	SS-03	7/9	370- 400	520		5600	N[f]	--		No	BSL
207-08-9	Benzo[k]fluoranthene	51		565	J	µg/kg	WS-18	11/12	400- 400	565		6200	C	900	SCC	No	BSL
218-01-9	Chrysene	56		1400		µg/kg	SS-03	8/9	370- 370	1400		62000	C	9,000	SCC	No	BSL
53-70-3	Dibenz[a,h]anthracene	50		150		µg/kg	SS-03	6/12	170- 400	150		62	C	660	SCC	**Yes**	ASL
206-44-0	Fluoranthene	94		2600		µg/kg	SS-03	9/9	-	2600		230000	N	2,300,000	SCC	No	BSL
86-73-7	Fluorene	41		370		µg/kg	SS-14	7/9	370- 480	370		270000	N	2,300,000	SCC	No	BSL
193-39-5	Indeno[1,2,3-cd]pyrene	75		470		µg/kg	SS-03	10/12	370- 400	470		620	C	900	SCC	No	BSL
91-20-3	Naphthalene	92		94		µg/kg	SS-03	2/9	360- 720	94		5600	N	230,000	SCC	No	BSL
85-01-8	Phenanthrene	160		2500		µg/kg	SS-03	7/9	370- 400	2500		230000	N[g]	--		No	BSL
129-00-0	Pyrene	43		2600		µg/kg	SS-03	9/9	-	2600		230000	N	1,700,000	SCC	No	BSL

Note: All results reported as dry weight.
For the purposes of screening, field replicates have been averaged.

-- - Soil cleanup criteria not available
– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
PAH - polycyclic aromatic hydrocarbon
PRG - preliminary remediation goal
Q - qualifier
SCC - New Jersey soil cleanup criteria as revised May 12, 1999, based on a combination of Tables 3-2 and 7-1 from the Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D.
TBC - to be considered

Rationale Codes:
Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically
Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Background values are from Sanders (2003) Table 1 - Ambient concentration of extractable metals measured in 248 New Jersey soil samples. The background values used are those for the 90th percentile (mg/kg) for the urban coastal plain.
[b] Screening toxicity values for soil are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.
[c] This default non-carcinogenic screening value for chromium is that for chromium(VI).
[d] This default non-carcinogenic screening value for mercury is that for methylmercury.
[e] This default non-carcinogenic screening value is that for *cis*-1,2-dichloroethene.
[f] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.
[g] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.3
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe	Current/Future
Medium:	Sediment
Exposure Medium:	Surface sediment
Exposure Point:	Undeveloped area surface sediment

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES																
7440-36-0	Antimony	-		-		mg/kg		0/2	1.8- 3.2	ND	<6	3.1	N	14	SCC	No	IFD
7440-38-2	Arsenic	2.6		8.8		mg/kg	SD-09	5/5	-	8.8	13.6	0.39	C	20	SCC	**Yes**	ASL
7440-39-3	Barium	72.1		226		mg/kg	SD-11	5/5	-	226	65.8	540	N	700	SCC	No	BSL
7440-41-7	Beryllium	0.83		0.83		mg/kg	SD-09	1/2	0.39- 0.39	0.83	0.68	15	N	2.0	SCC	No	BSL
7440-43-9	Cadmium	0.9	*J*	9.1		mg/kg	SD-11	5/5	-	9.1	<0.5	3.7	N	39	SCC	**Yes**	ASL
7440-70-2	Calcium	2050	*J*	3810		mg/kg	SD-09	2/2	-	3810	2000	N/A	N	--		No	NTX
7440-47-3	Chromium	55.4	*J*	156		mg/kg	SD-11	5/5	-	156	34.7	22	N[c]	240	SCC	**Yes**	ASL
7440-48-4	Cobalt	4.7		9.8		mg/kg	SD-09	2/2	-	9.8	<5	140	N	--		No	BSL
7440-50-8	Copper	94	*J*	194		mg/kg	SD-11	5/5	-	194	33.3	310	N	600	SCC	No	BSL
7439-92-1	Lead	188	*J*	469		mg/kg	SD-09	5/5	-	279	144	400	N	400	SCC	No	ASL[d]
7439-95-4	Magnesium	1680	*J*	3530		mg/kg	SD-09	2/2	-	3530	1870	N/A		--		No	NTX
7439-96-5	Manganese	85.3	*J*	179		mg/kg	SD-09	5/5	-	179	206	180	N	--		No	BSL
7439-97-6	Mercury	18.95		1290		mg/kg	SD-12	7/7	-	1290	0.21	0.61	N[e]	14	SCC	**Yes**	ASL
22967-92-6	Methylmercury	11.91		126		ng/g	SD-08	5/5	-	126	N/A	610	N	--		**Yes**	HIST[f]
7440-02-0	Nickel	14.2		29.2		mg/kg	SD-10	5/5	-	29.2	12.3	160	N	250	SCC	No	BSL
7440-09-7	Potassium	524		1260		mg/kg	SD-09	2/2	-	1260	1750	N/A		--		No	NTX
7782-49-2	Selenium	1		1.6		mg/kg	SD-10	3/5	1.3- 2.2	1.6	<1	39	N	63	SCC	No	BSL
7440-22-4	Silver	1.3		4.3		mg/kg	SD-12	3/5	0.16- 0.18	4.3	<1	39	N	110	SCC	No	BSL
7440-23-5	Sodium	-		-		mg/kg		0/2	658- 1130	ND	<500	N/A		--		No	IFD
7440-28-0	Thallium	1.8		4.8		mg/kg	SD-10	3/5	2.1- 3.6	4.8	<1	0.52	N	2.0	SCC	**Yes**	ASL
7440-62-2	Vanadium	44.2		69.4		mg/kg	SD-09	2/2	-	69.4	35.5	7.8	N	370	SCC	**Yes**	ASL
7440-66-6	Zinc	434		3540		mg/kg	SD-11	5/5	-	3540	106	2300	N	1,500	SCC	**Yes**	ASL
	ORGANIC ANALYTES																
	Petroleum hydrocarbons	60		60		mg/kg	SD-08	1/2	94- 94	60		N/A		--		No	NTX
120-82-1	1,2,4-Trichlorobenzene	-		-		µg/kg		0/2	330- 1600	ND		6200	N	68,000	SCC	No	IFD
95-50-1	1,2-Dichlorobenzene	-		-		µg/kg		0/2	330- 1600	ND		110000	N	5,100,000	SCC	No	IFD
541-73-1	1,3-Dichlorobenzene	-		-		µg/kg		0/2	330- 1600	ND		5300	N	5,100,000	SCC	No	IFD
106-46-7	1,4-Dichlorobenzene	-		-		µg/kg		0/2	330- 1600	ND		3400	C	570,000	SCC	No	IFD
108-60-1	2,2'-Oxybis[1-chloropropane]	-		-		µg/kg		0/2	330- 1600	ND		2900	C	--		No	IFD
95-95-4	2,4,5-Trichlorophenol	-		-		µg/kg		0/2	800- 4000	ND		610000	N	5,600,000	SCC	No	IFD
88-06-2	2,4,6-Trichlorophenol	-		-		µg/kg		0/2	330- 1600	ND		610	N	62,000	SCC	No	IFD
120-83-2	2,4-Dichlorophenol	-		-		µg/kg		0/2	330- 1600	ND		18000	N	170,000	SCC	No	IFD
105-67-9	2,4-Dimethylphenol	-		-		µg/kg		0/2	330- 1600	ND		120000	N	1,100,000	SCC	No	IFD
51-28-5	2,4-Dinitrophenol	-		-		µg/kg		0/2	800- 4000	ND		12000	N	110,000	SCC	No	IFD
121-14-2	2,4-Dinitrotoluene	-		-		µg/kg		0/2	330- 1600	ND		12000	N	--		No	IFD
606-20-2	2,6-Dinitrotoluene	-		-		µg/kg		0/2	330- 1600	ND		6100	N	--		No	IFD
91-58-7	2-Chloronaphthalene	-		-		µg/kg		0/2	330- 1600	ND		490000	N	--		No	IFD
95-57-8	2-Chlorophenol	-		-		µg/kg		0/2	330- 1600	ND		6300	N	280,000	SCC	No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol	-		-		µg/kg		0/2	800- 4000	ND		610	N	--		No	IFD
95-48-7	2-Methylphenol	-		-		µg/kg		0/2	330- 1600	ND		310000	N	2,800,000	SCC	No	IFD

Table 2.3
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe	Current/Future
Medium:	Sediment
Exposure Medium:	Surface sediment
Exposure Point:	Undeveloped area surface sediment

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
88-74-4	2-Nitroaniline	-		-		µg/kg		0/2	800- 4000	ND		18000	N	--		No	IFD
88-75-5	2-Nitrophenol	-		-		µg/kg		0/2	330- 1600	ND		N/A	N	--		No	IFD
91-94-1	3,3'-Dichlorobenzidine	-		-		µg/kg		0/2	330- 1600	ND		1100	C	2,000	SCC	No	IFD
99-09-2	3-Nitroaniline	-		-		µg/kg		0/2	800- 4000	ND		1800	N	--		No	IFD
101-55-3	4-Bromophenyl-phenyl ether	-		-		µg/kg		0/2	330- 1600	ND		N/A		--		No	IFD
59-50-7	4-Chloro-3-methylphenol	-		-		µg/kg		0/2	330- 1600	ND		N/A		10,000,000	SCC	No	IFD
106-47-8	4-Chloroaniline	-		-		µg/kg		0/2	330- 1600	ND		24000	N	230,000	SCC	No	IFD
7005-72-3	4-Chlorophenyl-phenyl ether	-		-		µg/kg		0/2	330- 1600	ND		N/A		--		No	IFD
106-44-5	4-Methylphenol	-		-		µg/kg		0/2	330- 1600	ND		31000	N	2,800,000	SCC	No	IFD
100-01-6	4-Nitroaniline	-		-		µg/kg		0/2	800- 4000	ND		18000	N	--		No	IFD
100-02-7	4-Nitrophenol	-		-		µg/kg		0/2	800- 4000	ND		N/A		--		No	IFD
111-91-1	bis[2-chloroethoxy]methane	-		-		µg/kg		0/2	330- 1600	ND		N/A		--		No	IFD
111-44-4	bis[2-chloroethyl]ether	-		-		µg/kg		0/2	330- 1600	ND		220	C	660	SCC	No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	-		-		µg/kg		0/2	330- 1500	ND		35000	C	49,000	SCC	No	IFD
85-68-7	Butylbenzyl phthalate	290		290		µg/kg	SD-08	1/2	1600- 1600	290		1200000	N	1,100,000	SCC	No	BSL
86-74-8	Carbazole	150		210		µg/kg	SD-09	2/2	-	210		24000	C	--		No	BSL
132-64-9	Dibenzofuran	-		-		µg/kg		0/2	330- 1600	ND		15000	N	--		No	IFD
84-66-2	Diethyl phthalate	-		-		µg/kg		0/2	330- 1600	ND		4900000	N	10,000,000	SCC	No	IFD
131-11-3	Dimethyl phthalate	-		-		µg/kg		0/2	330- 1600	ND		61000000	N	10,000,000	SCC	No	IFD
84-74-2	Di-n-butyl phthalate	160		160		µg/kg	SD-09	1/2	330- 330	160		610000	N	5,700,000	SCC	No	BSL
117-84-0	Di-n-octyl phthalate	-		-		µg/kg		0/2	330- 1600	ND		240000	N	1,100,000	SCC	No	IFD
118-74-1	Hexachlorobenzene	-		-		µg/kg		0/2	330- 1600	ND		300	C	660	SCC	No	IFD
87-68-3	Hexachlorobutadiene	-		-		µg/kg		0/2	330- 1600	ND		1800	N	1,000	SCC	No	IFD
77-47-4	Hexachlorocyclopentadiene	-		-		µg/kg		0/2	330- 1600	ND		37000	N	400,000	SCC	No	IFD
67-72-1	Hexachloroethane	-		-		µg/kg		0/2	330- 1600	ND		6100	N	6,000	SCC	No	IFD
78-59-1	Isophorone	-		-		µg/kg		0/2	330- 1600	ND		510000	C	1,100,000	SCC	No	IFD
98-95-3	Nitrobenzene	-		-		µg/kg		0/2	330- 1600	ND		2000	N	28,000	SCC	No	IFD
621-64-7	N-nitroso-di-n-propylamine	-		-		µg/kg		0/2	330- 1600	ND		69	C	660	SCC	No	IFD
86-30-6	N-nitrosodiphenylamine	-		-		µg/kg		0/2	330- 1600	ND		99000	C	140,000	SCC	No	IFD
87-86-5	Pentachlorophenol	-		-		µg/kg		0/2	800- 4000	ND		3000	C	6,000	SCC	No	IFD
108-95-2	Phenol	-		-		µg/kg		0/2	330- 1600	ND		1800000	N	10,000,000	SCC	No	IFD
71-55-6	1,1,1-Trichloroethane	-		-		µg/kg		0/2	28- 48	ND		200000	N	210,000	SCC	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane	-		-		µg/kg		0/2	28- 48	ND		410	C	34,000	SCC	No	IFD
79-00-5	1,1,2-Trichloroethane	-		-		µg/kg		0/2	28- 48	ND		730	C	22,000	SCC	No	IFD
75-34-3	1,1-Dichloroethane	-		-		µg/kg		0/2	28- 48	ND		51000	N	570,000	SCC	No	IFD
75-35-4	1,1-Dichloroethene	-		-		µg/kg		0/2	28- 48	ND		12400	N	8,000	SCC	No	IFD
107-06-2	1,2-Dichloroethane	-		-		µg/kg		0/2	28- 48	ND		280	C	6,000	SCC	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)	-		-		µg/kg		0/2	28- 48	ND		4300	N[g]	--		No	IFD
78-87-5	1,2-Dichloropropane	-		-		µg/kg		0/2	28- 48	ND		340	C	10,000	SCC	No	IFD
78-93-3	2-Butanone	-		-		µg/kg		0/2	28- 48	ND		2200000	N	1,000,000	SCC	No	IFD
591-78-6	2-Hexanone	-		-		µg/kg		0/2	28- 48	ND		N/A		--		No	IFD

Table 2.3
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe	Current/Future
Medium:	Sediment
Exposure Medium:	Surface sediment
Exposure Point:	Undeveloped area surface sediment

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
108-10-1	4-Methyl-2-pentanone	-		-		µg/kg		0/2	28- 48	ND		530000	N	1,000,000	SCC	No	IFD
67-64-1	Acetone	190	J	190	J	µg/kg	SD-08	1/2	290- 290	190		1400000	N	1,000,000	SCC	No	BSL
71-43-2	Benzene	-		-		µg/kg		0/2	28- 48	ND		640	C	3,000	SCC	No	IFD
75-27-4	Bromodichloromethane	-		-		µg/kg		0/2	28- 48	ND		820	C	11,000	SCC	No	IFD
75-25-2	Bromoform	-		-		µg/kg		0/2	28- 48	ND		62000	C	86,000	SCC	No	IFD
74-83-9	Bromomethane	-		-		µg/kg		0/2	28- 48	ND		390	N	79,000	SCC	No	IFD
75-15-0	Carbon disulfide	-		-		µg/kg		0/2	28- 48	ND		36000	N	--		No	IFD
56-23-5	Carbon tetrachloride	-		-		µg/kg		0/2	28- 48	ND		210	N	2,000	SCC	No	IFD
108-90-7	Chlorobenzene	-		-		µg/kg		0/2	28- 48	ND		15000	N	37,000	SCC	No	IFD
67-66-3	Chloroform	-		-		µg/kg		0/2	28- 48	ND		220	C	19,000	SCC	No	IFD
74-87-3	Chloromethane	-		-		µg/kg		0/2	28- 48	ND		4700	N	520,000	SCC	No	IFD
10061-01-5	cis-1,3-Dichloropropene	-		-		µg/kg		0/2	28- 48	ND		780	C	--		No	IFD
124-48-1	Dibromochloromethane	-		-		µg/kg		0/2	28- 48	ND		1100	C	110,000	SCC	No	IFD
100-41-4	Ethylbenzene	-		-		µg/kg		0/2	28- 48	ND		190000	N	1,000,000	SCC	No	IFD
75-09-2	Methylene chloride	-		-		µg/kg		0/2	28- 48	ND		9100	C	49,000	SCC	No	IFD
100-42-5	Styrene	-		-		µg/kg		0/2	28- 48	ND		440000	N	23,000	SCC	No	IFD
127-18-4	Tetrachloroethene	-		-		µg/kg		0/2	28- 48	ND		480	C	4,000	SCC	No	IFD
108-88-3	Toluene	-		-		µg/kg		0/2	28- 48	ND		66000	N	1,000,000	SCC	No	IFD
10061-02-6	trans-1,3-Dichloropropene	-		-		µg/kg		0/2	28- 48	ND		780	C	--		No	IFD
79-01-6	Trichloroethene	-		-		µg/kg		0/2	28- 48	ND		53	C	23,000	SCC	No	IFD
75-01-4	Vinyl chloride	-		-		µg/kg		0/2	28- 48	ND		79	C	2,000	SCC	No	IFD
1330-20-7	Xylene isomers (total)	-		-		µg/kg		0/2	28- 48	ND		27000	N	410,000	SCC	No	IFD
	PAHs																
91-57-6	2-Methylnaphthalene	-		-		µg/kg		0/2	330- 1600	ND		5600	N[h]	--		No	IFD
83-32-9	Acenaphthene	100		100		µg/kg	SD-08	1/5	810- 1600	100		370000	N	3,400,000	SCC	No	BSL
208-96-8	Acenaphthylene	180		490		µg/kg	SD-12	2/5	330- 1600	490		5600	N[h]	--		No	BSL
120-12-7	Anthracene	170		350		µg/kg	SD-09	5/5	-	350		2200000	N	10,000,000	SCC	No	BSL
56-55-3	Benz[a]anthracene	230		1700		µg/kg	SD-09	5/5	-	1700		620	C	900	SCC	**Yes**	ASL
50-32-8	Benzo[a]pyrene	300		1600		µg/kg	SD-09	5/5	-	1600		62	C	660	SCC	**Yes**	ASL
205-99-2	Benzo[b]fluoranthene	300		1800		µg/kg	SD-09	5/5	-	1800		620	C	900	SCC	**Yes**	ASL
191-24-2	Benzo[ghi]perylene	270		1200		µg/kg	SD-09	5/5	-	1200		5600	N[h]	--		No	BSL
207-08-9	Benzo[k]fluoranthene	280		660		µg/kg	SD-09	5/5	-	660		6200	C	900	SCC	No	BSL
218-01-9	Chrysene	330		1600		µg/kg	SD-09	5/5	-	1600		62000	C	9,000	SCC	No	BSL
53-70-3	Dibenz[a,h]anthracene	91		320		µg/kg	SD-09	5/5	-	320		62	C	660	SCC	**Yes**	ASL
206-44-0	Fluoranthene	510		2800	J	µg/kg	SD-09	5/5	-	2800		230000	N	2,300,000	SCC	No	BSL
86-73-7	Fluorene	110		170		µg/kg	SD-09	2/5	810- 960	170		270000	N	2,300,000	SCC	No	BSL
193-39-5	Indeno[1,2,3-cd]pyrene	220		1200		µg/kg	SD-09	5/5	-	1200		620	C	900	SCC	**Yes**	ASL
91-20-3	Naphthalene	100		100		µg/kg	SD-10	1/5	330- 1600	100		5600	N	230,000	SCC	No	BSL
85-01-8	Phenanthrene	180		1800		µg/kg	SD-09	5/5	-	1800		230000	N[l]	--		No	BSL
129-00-0	Pyrene	380		2900		µg/kg	SD-09	5/5	-	2900		230000	N	1,700,000	SCC	No	BSL

Table 2.3
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe	Current/Future
Medium:	Sediment
Exposure Medium:	Surface sediment
Exposure Point:	Undeveloped area surface sediment

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	PCBs									0							
12674-11-2	Aroclor® 1016	-		-		µg/kg		0/2	92- 160	ND		390	N	--		No	IFD
11104-28-2	Aroclor® 1221	-		-		µg/kg		0/2	92- 160	ND		110	N	--		No	IFD
11141-16-5	Aroclor® 1232	-		-		µg/kg		0/2	92- 160	ND		110	N	--		No	IFD
53469-21-9	Aroclor® 1242	-		-		µg/kg		0/2	92- 160	ND		110	N	--		No	IFD
12672-29-6	Aroclor® 1248	190		240		µg/kg	SD-08	2/2	-	240		110	N	--		**Yes**	ASL
11097-69-1	Aroclor® 1254	-		-		µg/kg		0/2	92- 160	ND		110	N	--		No	IFD
11096-82-5	Aroclor® 1260	260		490		µg/kg	SD-08	2/2	-	490		110	N	--		**Yes**	ASL

Note: All results reported as dry weight.
For the purposes of screening, field replicates have been averaged.

-- - Soil cleanup criteria not available
– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PRG - preliminary remediation goal
Q - qualifier
SCC - New Jersey soil cleanup criteria as revised May 12, 1999, based on a combination of Tables 3-2 and 7-1 from the Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D.
TBC - to be considered

Rationale Codes:
Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically
Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Background values are from Sanders (2003) Table 1 - Ambient concentration of extractable metals measured in 248 New Jersey soil samples. The background values used are those for the 90th percentile (mg/kg) for the urban coastal plain.
[b] Screening toxicity values for soil/sediment are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.
[c] This default non-carcinogenic screening value for chromium is that for chromium(VI).
[d] Consistent with EPA model inputs for for lead, screening was based on the mean concentration of 279 mg/kg rather than a maximum value.
[e] This default non-carcinogenic screening value for mercury is that for methylmercury.
[f] Methylmercury is included as a CoPC at the request of the New Jersey Department of Environmental Protection and U.S. EPA Region II reviewers.
[g] This default non-carcinogenic screening value is that for *cis*-1,2-dichloroethene.
[h] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.
[i] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.4
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe	Current/Future
Medium:	Soil
Exposure Medium:	Surface soil
Exposure Point:	Undeveloped area surface soil

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES																
7440-36-0	Antimony	0.52		53.7		mg/kg	SS-11	21/31	0.219- 0.96	53.7	<6	3.1	N	14	SCC	**Yes**	ASL
7440-38-2	Arsenic	1.6	*J*	26.4		mg/kg	MW-14	23/32	0.222- 53.3	26.4	13.6	0.39	C	20	SCC	**Yes**	ASL
7440-39-3	Barium	4.4		12000		mg/kg	HS-02	31/32	0.452- 0.452	12000	65.8	540	N	700	SCC	**Yes**	ASL
7440-41-7	Beryllium	0.35		0.35		mg/kg	SS-22	1/31	0.0441- 0.68	0.35	0.68	15	N	2.0	SCC	No	BSL
7440-43-9	Cadmium	0.25	*J*	31.1		mg/kg	HS-05	20/32	0.0626- 3.4	31.1	<0.5	3.7	N	39	SCC	**Yes**	ASL
7440-70-2	Calcium	170		202000		mg/kg	TP-04	29/31	532- 664	202000	2000	N/A	N	--		No	NTX
7440-47-3	Chromium	0.931		8230		mg/kg	HS-06	33/33	-	8230	34.7	22	N[c]	240	SCC	**Yes**	ASL
7440-48-4	Cobalt	2.3		14.4		mg/kg	SS-27	26/31	0.0812- 1.6	14.4	<5	140	N	--		No	BSL
7440-50-8	Copper	2.73		1010	*J*	mg/kg	SS-24	33/33	-	1010	33.3	310	N	600	SCC	**Yes**	ASL
57-12-5	Cyanide	-		-		mg/kg		0/3	1.13- 2.04	ND	N/A	1.1	N	1,100	SCC	No	IFD
7439-92-1	Lead	7.93		47600		mg/kg	HS-06	31/32	1.04- 1.04	2110	144	400	N	400	SCC	**Yes**	ASL[d]
7439-95-4	Magnesium	17.7		14700		mg/kg	TP-04	31/31	-	14700	1870	N/A		--		No	NTX
7439-96-5	Manganese	3.19		3090	*J*	mg/kg	SS-24	32/32	-	3090	206	180	N	--		**Yes**	ASL
7439-97-6	Mercury	0.331		295000	*J*	mg/kg	HS-05	40/40	-	295000	0.21	0.61	N[e]	14	SCC	**Yes**	ASL
22967-92-6	Methylmercury	0.59		322		ng/g	SS-20	9/9	-	322	N/A	610	N	--		**Yes**	HIST[f]
7440-02-0	Nickel	0.538		193		mg/kg	TP-01	30/33	0.512- 15.3	193	12.3	160	N	250	SCC	**Yes**	ASL
7440-09-7	Potassium	16.9		922		mg/kg	TP-01	29/31	22.6- 42	922	1750	N/A		--		No	NTX
7782-49-2	Selenium	0.82		2.0		mg/kg	TP-01	11/32	0.334- 2.4	2	<1	39	N	63	SCC	No	BSL
7440-22-4	Silver	0.18		93.8		mg/kg	TP-01	26/33	0.0545- 0.5	93.8	<1	39	N	110	SCC	**Yes**	ASL
7440-23-5	Sodium	271		2580		mg/kg	TP-01	5/31	49.9- 4670	2580	<500	N/A		--		No	NTX
18496-25-8	Sulfides	-		-		mg/kg		0/3	2.3- 4.1	ND	N/A	N/A	N	--		No	IFD
7440-28-0	Thallium	5.8	*J*	21.9		mg/kg	TP-01	4/33	0.415- 2.3	21.9	<1	0.52	N	2.0	SCC	**Yes**	ASL
7440-62-2	Vanadium	0.9		245		mg/kg	TP-01	30/32	0.108- 0.353	245	35.5	7.8	N	370	SCC	**Yes**	ASL
7440-66-6	Zinc	3.93		188000		mg/kg	TP-01	27/33	40.9- 476	188000	106	2300	N	1,500	SCC	**Yes**	ASL
	ORGANIC ANALYTES																
120-82-1	1,2,4-Trichlorobenzene	-		-		µg/kg		0/27	200- 23000	ND		6200	N	68,000	SCC	No	IFD
95-50-1	1,2-Dichlorobenzene	-		-		µg/kg		0/27	200- 23000	ND		110000	N	5,100,000	SCC	No	IFD
541-73-1	1,3-Dichlorobenzene	-		-		µg/kg		0/27	200- 23000	ND		53000	N	5,100,000	SCC	No	IFD
106-46-7	1,4-Dichlorobenzene	-		-		µg/kg		0/27	200- 23000	ND		3400	C	570,000	SCC	No	IFD
108-60-1	2,2'-Oxybis[1-chloropropane]	-		-		µg/kg		0/27	200- 23000	ND		2900	C	--		No	IFD
95-95-4	2,4,5-Trichlorophenol	-		-		µg/kg		0/27	870- 400000	ND		610000	N	5,600,000	SCC	No	IFD
88-06-2	2,4,6-Trichlorophenol	-		-		µg/kg		0/27	350- 77000	ND		610	N	62,000	SCC	No	IFD
120-83-2	2,4-Dichlorophenol	-		-		µg/kg		0/27	350- 77000	ND		18000	N	170,000	SCC	No	IFD
105-67-9	2,4-Dimethylphenol	-		-		µg/kg		0/27	350- 77000	ND		120000	N	1,100,000	SCC	No	IFD
51-28-5	2,4-Dinitrophenol	-		-		µg/kg		0/27	870- 400000	ND		12000	N	110,000	SCC	No	IFD
121-14-2	2,4-Dinitrotoluene	-		-		µg/kg		0/27	200- 23000	ND		12000	N	--		No	IFD
606-20-2	2,6-Dinitrotoluene	-		-		µg/kg		0/27	200- 23000	ND		6100	N	--		No	IFD
91-58-7	2-Chloronaphthalene	-		-		µg/kg		0/27	200- 23000	ND		490000	N	--		No	IFD
95-57-8	2-Chlorophenol	-		-		µg/kg		0/27	350- 77000	ND		6300	N	280,000	SCC	No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol	-		-		µg/kg		0/27	870- 400000	ND		610	N	--		No	IFD
95-48-7	2-Methylphenol	-		-		µg/kg		0/27	350- 77000	ND		310000	N	2,800,000	SCC	No	IFD
88-74-4	2-Nitroaniline	-		-		µg/kg		0/27	870- 400000	ND		18000	N	--		No	IFD
88-75-5	2-Nitrophenol	-		-		µg/kg		0/27	350- 77000	ND		N/A	N	--		No	IFD
91-94-1	3,3'-Dichlorobenzidine	-		-		µg/kg		0/27	200- 23000	ND		1100	C	2,000	SCC	No	IFD

Table 2.4
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
99-09-2	3-Nitroaniline	-		-		µg/kg		0/27	870- 400000	ND		1800	N	--		No	IFD
101-55-3	4-Bromophenyl-phenyl ether	-		-		µg/kg		0/27	200- 23000	ND		N/A		--		No	IFD
59-50-7	4-Chloro-3-methylphenol	-		-		µg/kg		0/27	200- 23000	ND		N/A		10,000,000	SCC	No	IFD
106-47-8	4-Chloroaniline	-		-		µg/kg		0/27	200- 23000	ND		24000	N	230,000	SCC	No	IFD
7005-72-3	4-Chlorophenyl-phenyl ether	-		-		µg/kg		0/27	200- 23000	ND		N/A		--		No	IFD
106-44-5	4-Methylphenol	-		-		µg/kg		0/27	350- 77000	ND		31000	N	2,800,000	SCC	No	IFD
100-01-6	4-Nitroaniline	-		-		µg/kg		0/27	870- 400000	ND		18000	N	--		No	IFD
100-02-7	4-Nitrophenol	-		-		µg/kg		0/27	870- 400000	ND		49000		--		No	IFD
65-85-0	Benzoic acid	0.11		0.11		mg/kg	MW-7	1/1	-	0.11		24000	N	--		No	BSL
111-91-1	bis[2-chloroethoxy]methane	-		-		µg/kg		0/27	200- 23000	ND		N/A		--		No	IFD
111-44-4	bis[2-chloroethyl]ether	-		-		µg/kg		0/27	200- 23000	ND		220	C	660	SCC	No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	110		380000		µg/kg	SS-18	15/28	79- 23000	380000		35000	C	49,000	SCC	**Yes**	ASL
85-68-7	Butylbenzyl phthalate	80		1500		µg/kg	SS-24	7/27	200- 23000	1500		1200000	N	1,100,000	SCC	No	BSL
86-74-8	Carbazole	39		930		µg/kg	SS-29	10/27	200- 23000	930		24000	C	--		No	BSL
132-64-9	Dibenzofuran	37		640		µg/kg	SS-29	5/28	200- 23000	640		15000	N	--		No	BSL
84-66-2	Diethyl phthalate	120		770		µg/kg	SS-24	5/27	200- 23000	770		4900000	N	10,000,000	SCC	No	BSL
131-11-3	Dimethyl phthalate	65		2000		µg/kg	SS-17	2/27	200- 23000	2000		61000000	N	10,000,000	SCC	No	BSL
84-74-2	Di-n-butyl phthalate	48		56000		µg/kg	TP-01	18/27	200- 7200	56000		610000	N	5,700,000	SCC	No	BSL
117-84-0	Di-n-octyl phthalate	280		38000		µg/kg	SS-18	2/27	200- 23000	38000		240000	N	1,100,000	SCC	No	BSL
118-74-1	Hexachlorobenzene	-		-		µg/kg		0/27	200- 23000	ND		300	C	660	SCC	No	IFD
87-68-3	Hexachlorobutadiene	-		-		µg/kg		0/27	200- 23000	ND		1800	N	1,000	SCC	No	IFD
77-47-4	Hexachlorocyclopentadiene	-		-		µg/kg		0/27	200- 23000	ND		37000	N	400,000	SCC	No	IFD
67-72-1	Hexachloroethane	-		-		µg/kg		0/27	200- 23000	ND		6100	N	6,000	SCC	No	IFD
78-59-1	Isophorone	-		-		µg/kg		0/27	200- 23000	ND		510000	C	1,100,000	SCC	No	IFD
98-95-3	Nitrobenzene	-		-		µg/kg		0/27	200- 23000	ND		2000	N	28,000	SCC	No	IFD
621-64-7	N-nitroso-di-n-propylamine	-		-		µg/kg		0/27	200- 23000	ND		69	C	660	SCC	No	IFD
86-30-6	N-nitrosodiphenylamine	130		130		µg/kg	TP-01	1/27	200- 23000	130		99000	C	140,000	SCC	No	BSL
87-86-5	Pentachlorophenol	-		-		µg/kg		0/27	870- 400000	ND		3000	C	6,000	SCC	No	IFD
108-95-2	Phenol	79		250		µg/kg	TP-01	2/27	350- 77000	250		1800000	N	10,000,000	SCC	No	BSL
	Phenols	5.08		9.07		mg/kg	TP-01	2/3	4.9- 4.9	9.07		N/A	N	--		No	NTX
71-55-6	1,1,1-Trichloroethane	-		-		µg/kg		0/27	10- 7200	ND		200000	N	210,000	SCC	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane	-		-		µg/kg		0/27	10- 7200	ND		410	C	34,000	SCC	No	IFD
79-00-5	1,1,2-Trichloroethane	-		-		µg/kg		0/27	10- 7200	ND		730	C	22,000	SCC	No	IFD
75-34-3	1,1-Dichloroethane	-		-		µg/kg		0/27	10- 7200	ND		51000	N	570,000	SCC	No	IFD
75-35-4	1,1-Dichloroethene	-		-		µg/kg		0/27	10- 7200	ND		12400	N	8,000	SCC	No	IFD
107-06-2	1,2-Dichloroethane	-		-		µg/kg		0/27	10- 7200	ND		280	C	6,000	SCC	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)	-		-		µg/kg		0/26	10- 7200	ND		4300	N[g]	--	SCC	No	IFD
78-87-5	1,2-Dichloropropane	-		-		µg/kg		0/27	10- 7200	ND		340	C	10,000	SCC	No	IFD
78-93-3	2-Butanone	-		-		µg/kg		0/27	10- 14000	ND		2200000	N	1,000,000	SCC	No	IFD
591-78-6	2-Hexanone	-		-		µg/kg		0/27	10- 14000	ND		N/A		--		No	IFD
108-10-1	4-Methyl-2-pentanone	870		870		µg/kg	TP-13	1/27	10- 14000	870		530000	N	1,000,000	SCC	No	BSL
67-64-1	Acetone	3800		12000		µg/kg	TP-01	2/27	2- 20	12000		1400000	N	1,000,000	SCC	No	BSL
71-43-2	Benzene	3.6	*J*	3.6	*J*	µg/kg	MW-14	1/28	10- 7200	3.6		640	C	3,000	SCC	No	BSL[h]
75-27-4	Bromodichloromethane	-		-		µg/kg		0/27	10- 7200	ND		820	C	11,000	SCC	No	IFD
75-25-2	Bromoform	-		-		µg/kg		0/27	10- 7200	ND		62000	C	86,000	SCC	No	IFD
74-83-9	Bromomethane	-		-		µg/kg		0/27	10- 14000	ND		390	N	79,000	SCC	No	IFD
75-15-0	Carbon disulfide	-		-		µg/kg		0/27	10- 7200	ND		36000	N	--		No	IFD
56-23-5	Carbon tetrachloride	-		-		µg/kg		0/27	10- 7200	ND		210	N	2,000	SCC	No	IFD
108-90-7	Chlorobenzene	-		-		µg/kg		0/28	6.3- 7200	ND		15000	N	37,000	SCC	No	IFD
67-66-3	Chloroform	-		-		µg/kg		0/27	10- 7200	ND		220	C	19,000	SCC	No	IFD

Table 2.4
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
74-87-3	Chloromethane	-		-		µg/kg		0/27	10- 14000	ND		4700	N	520,000	SCC	No	IFD
156-59-2	cis-1,2-Dichloroethene	-		-		µg/kg		0/1	1300- 1300	ND		4300	N	--		No	IFD
10061-01-5	cis-1,3-Dichloropropene	-		-		µg/kg		0/27	10- 7200	ND		780	C	--		No	IFD
124-48-1	Dibromochloromethane	-		-		µg/kg		0/26	10- 7200	ND		1100	C	110,000	SCC	No	IFD
100-41-4	Ethylbenzene	-		-		µg/kg		0/27	10- 7200	ND		190000	N	1,000,000	SCC	No	IFD
136777-61-2	meta & para Xylenes	1.3	*J*	1.3	*J*	µg/kg	MW-14	1/1	-	1.3		27000	N	--		No	NTX
75-09-2	Methylene chloride	-		-		µg/kg		0/27	3- 7200	ND		9100	C	49,000	SCC	No	IFD
95-47-6	ortho-Xylene	-		-		µg/kg		0/1	6.3- 6.3	ND		27000	N	--		No	IFD
100-42-5	Styrene	-		-		µg/kg		0/27	10- 7200	ND		440000	N	23,000	SCC	No	IFD
127-18-4	Tetrachloroethene	-		-		µg/kg		0/27	10- 7200	ND		480	C	4,000	SCC	No	IFD
108-88-3	Toluene	2.2	*J*	7000		µg/kg	TP-01	2/28	10- 7200	7000		66000	N	1,000,000	SCC	No	BSL
156-60-5	trans-1,2-Dichloroethene	-		-		µg/kg		0/1	1300- 1300	ND		6900	N	--		No	IFD
10061-02-6	trans-1,3-Dichloropropene	-		-		µg/kg		0/27	10- 7200	ND		780	C	--		No	IFD
79-01-6	Trichloroethene	-		-		µg/kg		0/27	10- 7200	ND		53	C	23,000	SCC	No	IFD
75-01-4	Vinyl chloride	-		-		µg/kg		0/27	10- 14000	ND		79	C	2,000	SCC	No	IFD
1330-20-7	Xylene isomers (total)	5100		5100		µg/kg	TP-01	1/27	10- 1300	5100		27000	N	410,000	SCC	No	BSL
	PAHs																
91-57-6	2-Methylnaphthalene	36		15000		µg/kg	TP-01	5/28	200- 7200	15000		5600	N[i]	--		**Yes**	ASL
83-32-9	Acenaphthene	45		1200		µg/kg	SS-29	9/28	200- 23000	1200		370000	N	3,400,000	SCC	No	BSL
208-96-8	Acenaphthylene	44		99		µg/kg	SS-12	6/28	200- 23000	99		5600	N[i]	--		No	BSL
120-12-7	Anthracene	45		4100		µg/kg	SS-29	17/28	200- 23000	4100		2200000	N	10,000,000	SCC	No	BSL
56-55-3	Benz[a]anthracene	78		4000		µg/kg	SS-17	22/27	200- 23000	4000		620	C	900	SCC	**Yes**	ASL
50-32-8	Benzo[a]pyrene	73		10000		µg/kg	SS-29	23/28	200- 23000	10000		62	C	660	SCC	**Yes**	ASL
205-99-2	Benzo[b]fluoranthene	160		13000		µg/kg	SS-29	20/28	200- 23000	13000		620	C	900	SCC	**Yes**	ASL
191-24-2	Benzo[ghi]perylene	48		2200		µg/kg	SS-29	22/27	200- 23000	2200		5600	N[i]	--		No	BSL
207-08-9	Benzo[k]fluoranthene	68		4700		µg/kg	SS-29	19/27	200- 23000	4700		6200	C	900	SCC	No	BSL
218-01-9	Chrysene	90		12000		µg/kg	SS-29	23/28	200- 23000	12000		62000	C	9,000	SCC	No	BSL
53-70-3	Dibenz[a,h]anthracene	44		900		µg/kg	SS-29	16/27	200- 23000	900		62	C	660	SCC	**Yes**	ASL
206-44-0	Fluoranthene	120		26000		µg/kg	SS-29	23/28	200- 23000	26000		230000	N	2,300,000	SCC	No	BSL
86-73-7	Fluorene	55		1100		µg/kg	SS-29	9/28	200- 23000	1100		270000	N	2,300,000	SCC	No	BSL
193-39-5	Indeno[1,2,3-cd]pyrene	57		2600		µg/kg	SS-29	21/27	200- 23000	2600		620	C	900	SCC	**Yes**	ASL
91-20-3	Naphthalene	62		120000		µg/kg	TP-01	7/27	200- 7200	120000		5600	N	230,000	SCC	**Yes**	ASL
85-01-8	Phenanthrene	59		16000		µg/kg	TP-01	24/28	200- 7200	16000		230000	N[j]	--		No	BSL
129-00-0	Pyrene	42		24000		µg/kg	TP-01	24/28	200- 23000	24000		230000	N	1,700,000	SCC	No	BSL
	PCBs																
12674-11-2	Aroclor® 1016	-		-		µg/kg		0/3	68- 1400	ND		390	N	--		No	IFD
11104-28-2	Aroclor® 1221	-		-		µg/kg		0/3	68- 1400	ND		110	N	--		No	IFD
11141-16-5	Aroclor® 1232	-		-		µg/kg		0/3	68- 1400	ND		110	N	--		No	IFD
53469-21-9	Aroclor® 1242	-		-		µg/kg		0/3	68- 1400	ND		110	N	--		No	IFD
12672-29-6	Aroclor® 1248	4400		4400		µg/kg	MW-7	1/4	68- 1400	4400		110	N	--		**Yes**	ASL
11097-69-1	Aroclor® 1254	-		-		µg/kg		0/3	68- 1400	ND		110	N	--		No	IFD
11096-82-5	Aroclor® 1260	-		-		µg/kg		0/3	68- 1400	ND		110	N	--		No	IFD
	PESTICIDES																
72-54-8	4,4'-DDD	-		-		µg/kg		0/3	6.8- 140	ND		2400	C	3,000	SCC	No	IFD
72-55-9	4,4'-DDE	-		-		µg/kg		0/3	6.8- 140	ND		1700	C	2,000	SCC	No	IFD
50-29-3	4,4'-DDT	-		-		µg/kg		0/3	6.8- 140	ND		1700	C	2,000	SCC	No	IFD
309-00-2	Aldrin	-		-		µg/kg		0/3	3.4- 73	ND		29	C	40	SCC	No	IFD
5103-71-9	alpha-Chlordane	-		-		µg/kg		0/3	3.4- 73	ND		1600	C	--		No	IFD
959-98-8	alpha-Endosulfan	-		-		µg/kg		0/3	3.4- 73	ND		37000	N[k]	--		No	IFD
319-84-6	alpha-Hexachlorocyclohexane	-		-		µg/kg		0/3	3.4- 73	ND		90	C	--		No	IFD

Table 2.4
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
33213-65-9	beta-Endosulfan	-		-		µg/kg		0/3	6.8- 140	ND		37000	N[k]	--		No	IFD
319-85-7	beta-Hexachlorocyclohexane	-		-		µg/kg		0/3	3.4- 73	ND		320	C	--		No	IFD
319-86-8	delta-Hexachlorocyclohexane	-		-		µg/kg		0/3	3.4- 73	ND		N/A		--		No	IFD
60-57-1	Dieldrin	-		-		µg/kg		0/3	6.8- 140	ND		30	C	42	SCC	No	IFD
1031-07-8	Endosulfan sulfate	-		-		µg/kg		0/3	6.8- 140	ND		37000	N[k]	--		No	IFD
72-20-8	Endrin	-		-		µg/kg		0/3	6.8- 140	ND		1800	N	17,000	SCC	No	IFD
7421-93-4	Endrin aldehyde	-		-		µg/kg		0/3	6.8- 140	ND		1800	N[l]	--		No	IFD
53494-70-5	Endrin ketone	-		-		µg/kg		0/3	6.8- 140	ND		1800	N[l]	--		No	IFD
5103-74-2	gamma-Chlordane	-		-		µg/kg		0/3	3.4- 73	ND		1600	C	--		No	IFD
58-89-9	gamma-Hexachlorocyclohexane	-		-		µg/kg		0/3	3.4- 73	ND		440	C	520	SCC	No	IFD
76-44-8	Heptachlor	-		-		µg/kg		0/3	3.4- 73	ND		110	C	150	SCC	No	IFD
1024-57-3	Heptachlor epoxide	-		-		µg/kg		0/3	3.4- 73	ND		53	C	--		No	IFD
72-43-5	Methoxychlor	-		-		µg/kg		0/3	34- 730	ND		31000	N	280,000	SCC	No	IFD
8001-35-2	Toxaphene	-		-		µg/kg		0/3	140- 2900	ND		440	C	100	SCC	No	IFD

Note: All results reported as dry weight.
For the purposes of screening, field replicates have been averaged.

-- - Soil cleanup criteria not available
– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PRG - preliminary remediation goal
Q - qualifier
SCC - New Jersey soil cleanup criteria as revised May 12, 1999, based on a combination of Tables 3-2 and 7-1 from the Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D.
TBC - to be considered

Rationale Codes:
Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically
Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Background values are from Sanders (2003) Table 1 - Ambient concentration of extractable metals measured in 248 New Jersey soil samples. The background values used are those for the 90th percentile (mg/kg) for the urban coastal plain.
[b] Screening toxicity values for soil/sediment are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.
[c] This default non-carcinogenic screening value for chromium is that for chromium(VI).
[d] Consistent with EPA model inputs for for lead, screening was based on a the mean concentration of 2,110 mg/kg rather than a maximum value.
[e] This default non-carcinogenic screening value for mercury is that for methylmercury.
[f] Methylmercury is included as a CoPC at the request of the New Jersey Department of Environmental Protection and U.S. EPA Region II reviewers.
[g] This default non-carcinogenic screening value is that for *cis*-1,2-dichloroethene.
[h] Although benzene is a Class A carcinogen, it has not been retained because it was detected infrequently (one time in 29 samples) and at a concentration 177 times below the screening value.
[i] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.
[j] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).
[k] This default non-carcinogenic screening value is that for *endosulfan.*
[l] This default non-carcinogenic screening value is that for *endrin* .

Table 2.5
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Subsurface soil
Exposure Point:	Developed area subsurface soil (1-20 ft depths)

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES																
7440-38-2	Arsenic	3.8		9.9		mg/kg	MW-13	4/4	-	9.9	13.6	0.39	C	20	SCC	Yes	ASL
7440-39-3	Barium	59.5		818		mg/kg	MW-13	4/4	-	818	65.8	540	N	700	SCC	Yes	ASL
7440-43-9	Cadmium	0.4		3.4		mg/kg	MW-15	4/4	-	3.4	<0.5	3.7	N	39	SCC	No	BSL
7440-47-3	Chromium	10.3		131		mg/kg	MW-15	4/4	-	131	34.7	22	N[c]	240	SCC	Yes	ASL
7440-50-8	Copper	23.4		7420		mg/kg	MW-15	5/5	-	7420	33.3	310	N	600	SCC	Yes	ASL
7439-92-1	Lead	5		307		mg/kg	MW-15	4/4	-	307	144	400	N	400	SCC	No	BSL
7439-96-5	Manganese	241		812		mg/kg	MW-13	4/4	-	812	206	180	N	--		Yes	ASL
7439-97-6	Mercury	0.42		5150		mg/kg	MW-13	35/35	-	5150	0.21	0.61	N[d]	14	SCC	Yes	ASL
7440-02-0	Nickel	9.7	*J*	87.8		mg/kg	MW-15	4/4	-	87.8	12.3	160	N	250	SCC	No	BSL
7782-49-2	Selenium	1.1		1.3		mg/kg	MW-13	3/4	0.43- 0.43	1.3	<1	39	N	63	SCC	No	BSL
7440-22-4	Silver	2.7		9.6		mg/kg	MW-15	2/4	0.08- 0.08	9.6	<1	39	N	110	SCC	No	BSL
7440-28-0	Thallium	0.9		5.4		mg/kg	MW-15	2/4	0.5- 0.51	5.4	<1	0.52	N	2	SCC	Yes	ASL
7440-66-6	Zinc	26.8		2110		mg/kg	MW-15	4/4	-	2110	106	2300	N	1,500	SCC	No	BSL
	ORGANIC ANALYTES																
65-85-0	Benzoic acid	0.12		0.14		mg/kg	MW-9	2/2	-	0.14		24000	N	--		No	BSL
117-81-7	bis[2-Ethylhexyl]phthalate	0.096		7.9		mg/kg	MW-9	8/8	-	7.9		35	C	49,000	SCC	No	BSL
85-68-7	Butylbenzyl phthalate	0.073		0.073		mg/kg	MW-9	1/1	-	0.073		1200	N	1,100,000	SCC	No	BSL
132-64-9	Dibenzofuran	2.3		2.3		mg/kg	MW-9	1/1	-	2.3		15	N	--		No	BSL
84-74-2	Di-n-butyl phthalate	0.33		3.3		mg/kg	MW-9	7/7	-	3.3		610	N	5,700,000	SCC	No	BSL
108-95-2	Phenol	0.89		0.89		mg/kg	MW-8	1/1	-	0.89		3700	N	10,000,000	SCC	No	BSL
71-43-2	Benzene	1.5		2800	*J*	µg/kg	MW-15	4/4	-	2800		640	C	3,000	SCC	Yes	ASL
108-90-7	Chlorobenzene	1.2	*J*	1.2	*J*	µg/kg	MW-15	1/4	5.2- 6.1	1.2		15000	N	37,000	SCC	No	BSL
100-41-4	Ethylbenzene	0.91		0.91		mg/kg	MW-9	1/1	-	0.91		190	C	1,000,000	SCC	No	BSL
136777-61-2	meta & para Xylenes	4.1	*J*	17	*J*	µg/kg	MW-15	2/4	5.2- 5.5	17		27000	N	--		No	NTX
95-47-6	ortho-Xylene	20	*J*	20	*J*	µg/kg	MW-15	1/4	5.2- 6.1	20		27000	N	--		No	NTX
108-88-3	Toluene	4	*J*	11	*J*	µg/kg	MW-15	2/4	5.2- 5.5	11		66000	N	1,000,000	SCC	No	BSL
	PAHs																
91-57-6	2-Methylnaphthalene	11		11		mg/kg	MW-9	1/1	-	11		5.6	N[e]	--		Yes	ASL
56-55-3	Benz[a]anthracene	0.26		0.26		mg/kg	MW-10	1/1	-	0.26		0.62	C	900	SCC	No	BSL
218-01-9	Chrysene	0.049		0.33		mg/kg	MW-10	2/2	-	0.33		62	C	9,000	SCC	No	BSL
206-44-0	Fluoranthene	0.023		0.44		mg/kg	MW-9	3/3	-	0.44		230	N	2,300,000	SCC	No	BSL
86-73-7	Fluorene	3.4		3.4		mg/kg	MW-9	1/1	-	3.4		270	N	2,300,000	SCC	No	BSL
91-20-3	Naphthalene	2.4		2.4		mg/kg	MW-9	1/1	-	2.4		5.6	N	230,000	SCC	No	BSL
85-01-8	Phenanthrene	0.15		5.5		mg/kg	MW-9	2/2	-	5.5		230	N[f]	--		No	BSL
129-00-0	Pyrene	0.049		0.26		mg/kg	MW-9	3/3	-	0.26		230	N	1,700,000	SCC	No	BSL
	PCBs																
11096-82-5	Aroclor® 1260	0.36		0.36		mg/kg	MW-9	1/1	-	0.36		0.11	N	--	SCC	Yes	ASL

Table 2.5
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Note: All results reported as dry weight.
For the purposes of screening, field replicates have been averaged.

-- - Soil cleanup criteria not available
– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PRG - preliminary remediation goal
Q - qualifier
SCC - New Jersey soil cleanup criteria as revised May 12, 1999, based on a combination of Tables 3-2 and 7-1 from the Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D.
TBC - to be considered

Rationale Codes:

Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically

Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Background values are from Sanders (2003) Table 1 - Ambient concentration of extractable metals measured in 248 New Jersey soil samples. The background values used are those for the 90th percentile (mg/kg) for the urban coastal plain.
[b] Screening toxicity values for soil/sediment are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.
[c] This default non-carcinogenic screening value for chromium is that for chromium(VI).
[e] This default non-carcinogenic screening value for mercury is that for methylmercury.
[e] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.
[f] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.6
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Subsurface soil
Exposure Point:	Undeveloped area subsurface soil (1-20 ft depths)

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES																
7440-36-0	Antimony	0.327		97.3		mg/kg	TP-13	37/48	0.45- 3.63	97.3	<6	3.1	N	14	SCC	Yes	ASL
7440-38-2	Arsenic	1.4		120		mg/kg	TP-15	43/51	0.46- 5.8	120	13.6	0.39	C	20	SCC	Yes	ASL
7440-39-3	Barium	2.8		11200		mg/kg	TP-15	50/50	-	11200	65.8	540	N	700	SCC	Yes	ASL
7440-41-7	Beryllium	1.1		7.4		mg/kg	TP-05	4/48	0.0396- 1.21	7.4	0.68	15	N	2.0	SCC	No	BSL
7440-43-9	Cadmium	0.29		36.1		mg/kg	TP-15	47/50	0.17- 0.587	36.1	<0.5	3.7	N	39	SCC	Yes	ASL
7440-70-2	Calcium	233		254000		mg/kg	TP-14	48/48	-	254000	2000	N/A	N	--		No	NTX
7440-47-3	Chromium	2.64		9840		mg/kg	TP-13	50/51	2- 2	9840	34.7	22	N[c]	240	SCC	Yes	ASL
7440-48-4	Cobalt	0.42		42.5		mg/kg	TP-15	45/48	0.23- 0.466	42.5	<5	140	N	--		No	BSL
7440-50-8	Copper	3.31		8720	J	mg/kg	TP-19	50/51	0.4- 0.4	8720	33.3	310	N	600	SCC	Yes	ASL
7439-92-1	Lead	2.77		58200		mg/kg	TP-13	49/50	29- 29	2096	144	400	N	400	SCC	Yes	ASL[d]
7439-95-4	Magnesium	32.9		9430		mg/kg	TP-16	48/48	-	9430	1870	N/A		--		No	NTX
7439-96-5	Manganese	9.3	J	23300	J	mg/kg	TP-03	50/50	-	23300	206	180	N	--		Yes	ASL
7439-97-6	Mercury	0.15		34700		mg/kg	TP-17	103/104	0.15- 0.15	34700	0.21	0.61	N[e]	14	SCC	Yes	ASL
22967-92-6	Methylmercury	0.1		7.44		ng/g	TP-13	7/7	-	7.44	N/A	610	N	--		Yes	HIST[f]
7440-02-0	Nickel	1.39		317		mg/kg	TP-15	50/51	0.26- 0.26	317	12.3	160	N	250	SCC	Yes	ASL
7440-09-7	Potassium	39.4		4120		mg/kg	TP-15	48/48	-	4120	1750	N/A		--		No	NTX
7782-49-2	Selenium	0.658		42.8		mg/kg	HS-04	17/50	0.3- 8.8	42.8	<1	39	N	63	SCC	Yes	ASL
7440-22-4	Silver	0.0949		1580		mg/kg	TP-05	42/51	0.1- 0.36	1580	<1	39	N	110	SCC	Yes	ASL
7440-23-5	Sodium	63		18900		mg/kg	TP-05	27/48	45.7- 645	18900	<500	N/A		--		No	NTX
7440-28-0	Thallium	9.4		12.9		mg/kg	TP-05	4/51	0.373- 8.8	12.9	<1	0.52	N	2.0	SCC	Yes	ASL
7440-62-2	Vanadium	3		980		mg/kg	TP-12	47/49	0.458- 1.2	980	35.5	7.8	N	370	SCC	Yes	ASL
7440-66-6	Zinc	8.28		43200		mg/kg	TP-17	53/53	-	43200	106	2300	N	1,500	SCC	Yes	ASL
	ORGANIC ANALYTES																
120-82-1	1,2,4-Trichlorobenzene					µg/kg		0/38	370- 1000	ND		6200	N	68,000	SCC	No	IFD
95-50-1	1,2-Dichlorobenzene					µg/kg		0/38	370- 1000	ND		110000	N	5,100,000	SCC	No	IFD
541-73-1	1,3-Dichlorobenzene	82		130		µg/kg	TP-17	2/38	370- 1000	130		53000	N	5,100,000	SCC	No	BSL
106-46-7	1,4-Dichlorobenzene	130		200		µg/kg	TP-10	2/38	370- 1000	200		3400	C	570,000	SCC	No	BSL
108-60-1	2,2'-Oxybis[1-chloropropane]					µg/kg		0/38	370- 1000	ND		2900	C	--		No	IFD
95-95-4	2,4,5-Trichlorophenol					µg/kg		0/38	930- 2500	ND		610000	N	5,600,000	SCC	No	IFD
88-06-2	2,4,6-Trichlorophenol	66	J	66	J	µg/kg	TP-13	1/38	370- 1000	66		610	N	62,000	SCC	No	BSL
120-83-2	2,4-Dichlorophenol					µg/kg		0/38	370- 1000	ND		18000	N	170,000	SCC	No	IFD
105-67-9	2,4-Dimethylphenol	200		200		µg/kg	TP-18	1/38	370- 1000	200		120000	N	1,100,000	SCC	No	BSL
51-28-5	2,4-Dinitrophenol	15	J	15	J	µg/kg	TP-18	1/38	930- 2500	15		12000	N	110,000	SCC	No	BSL
121-14-2	2,4-Dinitrotoluene					µg/kg		0/38	370- 1000	ND		12000	N	--		No	IFD
606-20-2	2,6-Dinitrotoluene					µg/kg		0/38	370- 1000	ND		6100	N	--		No	IFD
91-58-7	2-Chloronaphthalene	230		230		µg/kg	TP-10	1/38	370- 1000	230		490000	N	--		No	BSL
95-57-8	2-Chlorophenol					µg/kg		0/38	370- 1000	ND		6300	N	280,000	SCC	No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol					µg/kg		0/38	510- 2500	ND		610	N	--		No	IFD
95-48-7	2-Methylphenol	140		140		µg/kg	TP-18	1/38	370- 1000	140		310000	N	2,800,000	SCC	No	BSL
88-74-4	2-Nitroaniline					µg/kg		0/38	930- 2500	ND		18000	N	--		No	IFD
88-75-5	2-Nitrophenol					µg/kg		0/38	370- 1000	ND		N/A		--		No	IFD
91-94-1	3,3'-Dichlorobenzidine	100		100		µg/kg	TP-18	1/38	370- 1000	100		1100	C	2,000	SCC	No	BSL
99-09-2	3-Nitroaniline					µg/kg		0/38	930- 2500	ND		1800	N	--		No	IFD
101-55-3	4-Bromophenyl-phenyl ether					µg/kg		0/38	370- 1000	ND		N/A		--		No	IFD

Table 2.6
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
59-50-7	4-Chloro-3-methylphenol					µg/kg		0/38	370- 1000	ND		N/A		10,000,000	SCC	No	IFD
106-47-8	4-Chloroaniline					µg/kg		0/38	370- 1000	ND		24000	N	230,000	SCC	No	IFD
7005-72-3	4-Chlorophenyl-phenyl ether					µg/kg		0/38	370- 1000	ND		N/A		--		No	IFD
106-44-5	4-Methylphenol	78		410		µg/kg	TP-18	2/38	370- 1000	410		31000	N	2,800,000	SCC	No	BSL
100-01-6	4-Nitroaniline					µg/kg		0/38	930- 2500	ND		18000	N	--		No	IFD
100-02-7	4-Nitrophenol					µg/kg		0/38	930- 2500	ND		N/A		--		No	IFD
65-85-0	Benzoic acid	0.013		0.11		mg/kg	MW-7	4/4	-	0.11		24000	N	--		No	BSL
111-91-1	bis[2-chloroethoxy]methane					µg/kg		0/38	370- 1000	ND		N/A		--		No	IFD
111-44-4	bis[2-chloroethyl]ether					µg/kg		0/38	370- 1000	ND		220	C	660	SCC	No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	0.095		22		mg/kg	TP-13	42/48	0.37- 1	22		35	C	49,000	SCC	No	BSL
85-68-7	Butylbenzyl phthalate	0.013		1.4		mg/kg	MW-4	12/41	0.071- 1	1.4		1200	N	1,100,000	SCC	No	BSL
86-74-8	Carbazole	43		25000		µg/kg	TP-18	12/38	370- 1000	25000		24000	C	--		**Yes**	ASL
132-64-9	Dibenzofuran	0.003		16		mg/kg	TP-18	8/40	0.37- 1	16		15	N	--		**Yes**	ASL
84-66-2	Diethyl phthalate	0.045		0.66		mg/kg	TP-20	12/41	0.37- 1	0.66		4900	N	10,000,000	SCC	No	BSL
131-11-3	Dimethyl phthalate	240		670		µg/kg	TP-08	2/38	370- 1000	670		61000000	N	10,000,000	SCC	No	BSL
84-74-2	Di-n-butyl phthalate	0.05		37	*J*	mg/kg	TP-08	28/47	0.37- 3.8	37		610	N	5,700,000	SCC	No	BSL
117-84-0	Di-n-octyl phthalate	0.01		2.5		mg/kg	TP-13	4/40	0.37- 1	2.5		240	N	1,100,000	SCC	No	BSL
118-74-1	Hexachlorobenzene	94		94		µg/kg	TP-09	1/38	370- 1000	94		300	C	660	SCC	No	BSL
87-68-3	Hexachlorobutadiene					µg/kg		0/38	370- 1000	ND		1800	N	1,000	SCC	No	IFD
77-47-4	Hexachlorocyclopentadiene					µg/kg		0/38	370- 1000	ND		37000	N	400,000	SCC	No	IFD
67-72-1	Hexachloroethane					µg/kg		0/38	370- 1000	ND		6100	N	6,000	SCC	No	IFD
78-59-1	Isophorone					µg/kg		0/38	370- 1000	ND		510000	C	1,100,000	SCC	No	IFD
98-95-3	Nitrobenzene					µg/kg		0/38	370- 1000	ND		2000	N	28,000	SCC	No	IFD
621-64-7	N-nitroso-di-n-propylamine					µg/kg		0/38	370- 1000	ND		69	C	660	SCC	No	IFD
86-30-6	N-nitrosodiphenylamine	50		230		µg/kg	TP-05	5/38	370- 1000	230		99000	C	140,000	SCC	No	BSL
87-86-5	Pentachlorophenol	67		140	*J*	µg/kg	TP-09	2/38	930- 2500	140		3000	C	6,000	SCC	No	BSL
108-95-2	Phenol	78		310		µg/kg	TP-18	2/38	370- 1000	310		1800000	N	10,000,000	SCC	No	BSL
71-55-6	1,1,1-Trichloroethane					µg/kg		0/38	11- 30	ND		200000	N	210,000	SCC	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane					µg/kg		0/38	11- 30	ND		410	C	34,000	SCC	No	IFD
79-00-5	1,1,2-Trichloroethane					µg/kg		0/38	11- 30	ND		730	C	22,000	SCC	No	IFD
75-34-3	1,1-Dichloroethane					µg/kg		0/38	11- 30	ND		51000	N	570,000	SCC	No	IFD
75-35-4	1,1-Dichloroethene					µg/kg		0/38	11- 30	ND		12400	N	8,000	SCC	No	IFD
107-06-2	1,2-Dichloroethane					µg/kg		0/38	11- 30	ND		280	C	6,000	SCC	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)					µg/kg		0/38	11- 30	ND		4300	N[g]	--		No	IFD
78-87-5	1,2-Dichloropropane					µg/kg		0/38	11- 30	ND		340	C	10,000	SCC	No	IFD
78-93-3	2-Butanone	0.085	*J*	0.28		mg/kg	MW-6	2/39	0.011- 0.021	0.28		2200	N	1,000,000	SCC	No	BSL
591-78-6	2-Hexanone					µg/kg		0/38	11- 30	ND		N/A		--		No	IFD
108-10-1	4-Methyl-2-pentanone					µg/kg		0/38	11- 30	ND		530000	N	1,000,000	SCC	No	IFD
67-64-1	Acetone	8	*J*	220	*J*	µg/kg	TP-02	4/38	11- 21	220		1400000	N	1,000,000	SCC	No	BSL
71-43-2	Benzene	0.0036	*J*	0.01		mg/kg	TP-13	5/41	0.011- 0.03	0.01		0.64	C	3,000	SCC	No	BSL[h]
75-27-4	Bromodichloromethane					µg/kg		0/38	11- 30	ND		820	C	11,000	SCC	No	IFD
75-25-2	Bromoform					µg/kg		0/38	11- 30	ND		62000	C	86,000	SCC	No	IFD
74-83-9	Bromomethane					µg/kg		0/38	11- 30	ND		390	N	79,000	SCC	No	IFD
75-15-0	Carbon disulfide	8		8		µg/kg	TP-02	1/38	11- 21	8		36000	N	--		No	BSL
56-23-5	Carbon tetrachloride					µg/kg		0/38	11- 30	ND		210	N	2,000	SCC	No	IFD
108-90-7	Chlorobenzene	10		10		µg/kg	TP-10	1/40	6.3- 30	10		15000	N	37,000	SCC	No	BSL
67-66-3	Chloroform					µg/kg		0/38	11- 30	ND		220	C	19,000	SCC	No	IFD
74-87-3	Chloromethane					µg/kg		0/38	11- 30	ND		4700	N	520,000	SCC	No	IFD
10061-01-5	cis-1,3-Dichloropropene					µg/kg		0/38	11- 30	ND		780	C	--		No	IFD
124-48-1	Dibromochloromethane					µg/kg		0/38	11- 30	ND		1100	C	110,000	SCC	No	IFD

Table 2.6
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
100-41-4	Ethylbenzene	0.002		0.31		mg/kg	TP-13	5/40	0.011- 0.03	0.31		190	N	1,000,000	SCC	No	BSL
136777-61-2	meta & para Xylenes	1.3	*J*	1.3	*J*	µg/kg	MW-14	1/2	8.6- 8.6	1.3		27	N	--		No	NTX
75-09-2	Methylene chloride	3	*J*	7.5	*J*	µg/kg	TP-08	5/38	11- 30	7.5		9100	C	49,000	SCC	No	BSL
95-47-6	ortho-Xylene					µg/kg		0/2	6.3- 8.6	ND		27	N	--		No	IFD
100-42-5	Styrene					µg/kg		0/38	11- 30	ND		440000	N	23,000	SCC	No	IFD
127-18-4	Tetrachloroethene					µg/kg		0/38	11- 30	ND		480	C	4,000	SCC	No	IFD
108-88-3	Toluene	0.0022	*J*	70		mg/kg	TP-13	8/43	0.011- 0.03	70		66	N	1,000,000	SCC	**Yes**	ASL
10061-02-6	trans-1,3-Dichloropropene					µg/kg		0/38	11- 30	ND		780	C	--		No	IFD
79-01-6	Trichloroethene					µg/kg		0/38	11- 30	ND		53	C	23,000	SCC	No	IFD
75-01-4	Vinyl chloride					µg/kg		0/38	11- 30	ND		79	C	2,000	SCC	No	IFD
1330-20-7	Xylene isomers (total)	0.017		110		mg/kg	TP-13	5/40	0.011- 0.03	110		27	N	410,000	SCC	**Yes**	ASL
	PAHs																
91-57-6	2-Methylnaphthalene	0.007		8.8		mg/kg	TP-18	12/44	0.37- 1	8.8		5.6	N[i]	--		**Yes**	ASL
83-32-9	Acenaphthene	0.045		36		mg/kg	TP-18	9/39	0.37- 1	36		370	N	3,400,000	SCC	No	BSL
208-96-8	Acenaphthylene	0.032		0.241		mg/kg	TP-20	13/40	0.37- 1	0.241		5.6	N[i]	--		No	BSL
120-12-7	Anthracene	0.009		44		mg/kg	TP-18	28/42	0.37- 1	44		2200	N	10,000,000	SCC	No	BSL
56-55-3	Benz[a]anthracene	55		62000		µg/kg	TP-18	29/38	380- 1000	62000		620	C	900	SCC	**Yes**	ASL
50-32-8	Benzo[a]pyrene	0.072		52		mg/kg	TP-18	29/40	0.38- 1	52		0.062	C	660	SCC	**Yes**	ASL
205-99-2	Benzo[b]fluoranthene	0.074		64		mg/kg	TP-18	31/40	0.38- 1	64		0.62	C	900	SCC	**Yes**	ASL
191-24-2	Benzo[ghi]perylene	50		19000		µg/kg	TP-18	28/38	380- 1000	19000		5600	N[i]	--		**Yes**	ASL
207-08-9	Benzo[k]fluoranthene	44		16000		µg/kg	TP-18	25/38	380- 1000	16000		6200	C	900	SCC	**Yes**	ASL
218-01-9	Chrysene	0.027		61		mg/kg	TP-18	34/42	0.38- 1	61		62	C	9,000	SCC	No	BSL
53-70-3	Dibenz[a,h]anthracene	53		1300		µg/kg	TP-18	20/38	370- 1000	1300		62	C	660	SCC	**Yes**	ASL
206-44-0	Fluoranthene	0.026		130	*J*	mg/kg	TP-18	36/43	0.38- 1	130		230	N	2,300,000	SCC	No	BSL
86-73-7	Fluorene	0.055		25		mg/kg	TP-18	11/39	0.37- 1	25		270	N	2,300,000	SCC	No	BSL
193-39-5	Indeno[1,2,3-cd]pyrene	45		20000		µg/kg	TP-18	26/38	380- 1000	20000		620	C	900	SCC	**Yes**	ASL
91-20-3	Naphthalene	0.009		22		mg/kg	TP-18	14/42	0.37- 1	22		5.6	N	230,000	SCC	**Yes**	ASL
85-01-8	Phenanthrene	0.015		140	*J*	mg/kg	TP-18	34/44	0.38- 1	140		230	N[j]	--		No	BSL
129-00-0	Pyrene	0.006		86	*J*	mg/kg	TP-18	37/44	0.056- 1	86		230	N	1,700,000	SCC	No	BSL
	PCBs																
53469-21-9	Aroclor® 1242	0.79		0.79		mg/kg	MW-7	1/1	-	0.79		0.11	N	--		**Yes**	ASL
12672-29-6	Aroclor® 1248	4.4		4.4		mg/kg	MW-7	1/1	-	4.4		0.11	N	--		**Yes**	ASL
11097-69-1	Aroclor® 1254	0.55		0.55		mg/kg	MW-5	1/1	-	0.55		0.11	N	--		**Yes**	ASL
11096-82-5	Aroclor® 1260	0.083		0.083		mg/kg	MW-2	1/1	-	0.083		0.11	N	--		No	BSL
	PESTICIDES																
50-29-3	4,4'-DDT	0.034		0.034		mg/kg	MW-6	1/1	-	0.034		1.7	C	2,000	SCC	No	BSL
5103-71-9	alpha-Chlordane	0.067		0.067		mg/kg	MW-6	1/1	-	0.067		1.6	C	--		No	BSL
5103-74-2	gamma-Chlordane	0.061		0.09		mg/kg	MW-5	2/2	-	0.09		1.6	C	--		No	BSL

Table 2.6
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value[a]	Screening Toxicity Values[b]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection

Note: All results reported as dry weight.
For the purposes of screening, field replicates have been averaged.

-- - Soil cleanup criteria not available
– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PRG - preliminary remediation goal
Q - qualifier
SCC - New Jersey soil cleanup criteria as revised May 12, 1999, based on a combination of Tables 3-2 and 7-1 from the Department of Environmental Protection and Energy's February 3, 1992 proposed rule entitled Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D.
TBC - to be considered

Rationale Codes:
Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically
Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Background values are from Sanders (2003) Table 1 - Ambient concentration of extractable metals measured in 248 New Jersey soil samples. The background values used are those for the 90th percentile (mg/kg) for the urban coastal plain.
[b] Screening toxicity values for soil/sediment are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.
[c] This default non-carcinogenic screening value for chromium is that for chromium(VI).
[d] Consistent with EPA model inputs for for lead, screening was based on the mean concentration of 2,096 mg/kg rather than a maximum value.
[e] This default non-carcinogenic screening value for mercury is that for methylmercury.
[f] Methylmercury is included as a CoPC at the request of the New Jersey Department of Environmental Protection and U.S. EPA Region II reviewers.
[g] This default non-carcinogenic screening value is that for *cis*-1,2-dichloroethene.
[h] Although benzene is a Class A carcinogen, it has not been retained because it was detected infrequently (five times in 41 samples) and at a concentration 64 times below the screening value.
[i] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.
[j] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.7
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Surface water
Exposure Medium:	Surface water
Exposure Point:	Undeveloped Area surface water

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES															
7440-36-0	Antimony	–		–		µg/L		0/2	3.4–3.4	ND	N/A	1.5 N	6.0	MCL	No	IFD
7440-38-2	Arsenic	–		–		µg/L		0/5	2.4–5.5	ND	N/A	0.045 C	50	MCL	No	IFD
7440-39-3	Barium	40		189		µg/L	SW-09	5/5	–	189	N/A	260 N	2000	MCL	No	BSL
7440-41-7	Beryllium	–		–		µg/L		0/2	0.19–0.19	ND	N/A	7.3 N	4.0	MCL	No	IFD
7440-43-9	Cadmium	1.2		1.2		µg/L	SW-11	1/5	0.21–0.62	1.2	N/A	1.8 N	5.0	MCL	No	BSL
7440-70-2	Calcium	54000		55600		µg/L	SW-09	2/2	–	55600	N/A	N/A			No	NUT
7440-47-3	Chromium	1.7		6.2		µg/L	SW-11	3/5	1.2–1.2	6.2	N/A	11 N[b]	100	MCL	No	BSL
7440-48-4	Cobalt	–		–		µg/L		0/2	1–1.4	ND	N/A	73 N			No	IFD
7440-50-8	Copper	2.4		3.2		µg/L	SW-08	2/5	5.9–13	3.2	N/A	150 N	1300	TT	No	BSL
7439-92-1	Lead	2		19		µg/L	SW-11	5/5	–	7.1	N/A	15 MCL	15	TT	No	ASL[c]
7439-95-4	Magnesium	66200		67500		µg/L	SW-09	2/2	–	67500	N/A	N/A			No	NUT
7439-96-5	Manganese	141		413		µg/L	SW-10	5/5	–	413	N/A	88 N[d]			**Yes**	ASL
7439-97-6	Mercury (total)	402		17600		ng/L	SW-08	5/5	–	17600	N/A	360 N	2.0	MCL	**Yes**	ASL
22967-92-6	Methylmercury	1.14		2.77		ng/L	SW-12	5/5	–	2.77	N/A	360 N			**Yes**	HIST[e]
7440-02-0	Nickel	1.7		3.6		µg/L	SW-10	3/5	4–4.4	3.6	N/A	73 N			No	BSL
7440-09-7	Potassium	27600	*J*	28000	*J*	µg/L	SW-09	2/2	–	28000	N/A	N/A			No	NUT
7782-49-2	Selenium	–		–		µg/L		0/5	2.4–3.8	ND	N/A	18 N	50	MCL	No	IFD
7440-22-4	Silver	–		–		µg/L		0/5	0.67–1.8	ND	N/A	18 N			No	IFD
7440-23-5	Sodium	396000	*J*	438000	*J*	µg/L	SW-09	2/2	–	438000	N/A	N/A			No	NUT
7440-28-0	Thallium	–		–		µg/L		0/5	4.4–6.4	ND	N/A	0.24 N	2.0	MCL	No	IFD
7440-62-2	Vanadium	2.6		3		µg/L	SW-08	2/2	–	3	N/A	3.6 N			No	BSL
7440-66-6	Zinc	35.9	*J*	403		µg/L	SW-11	4/5	54.1–54.1	403	N/A	1100 N			No	BSL
	ORGANIC ANALYTES															
	Petroleum hydrocarbons	–		–		mg/L		0/2	0.5–0.5	ND		N/A			No	IFD
120-82-1	1,2,4-Trichlorobenzene	–		–		µg/L		0/2	10–10	ND		7.2 N	70	MCL	No	IFD
95-50-1	1,2-Dichlorobenzene	–		–		µg/L		0/2	10–10	ND		37 N	600	MCL	No	IFD
541-73-1	1,3-Dichlorobenzene	–		–		µg/L		0/2	10–10	ND		18 N			No	IFD
106-46-7	1,4-Dichlorobenzene	–		–		µg/L		0/2	10–10	ND		0.5 C	75	MCL	No	IFD
108-60-1	2,2'-Oxybis[1-chloropropane]	–		–		µg/L		0/2	10–10	ND		0.27 C			No	IFD
95-95-4	2,4,5-Trichlorophenol	–		–		µg/L		0/2	25–25	ND		360 N			No	IFD
88-06-2	2,4,6-Trichlorophenol	–		–		µg/L		0/2	10–10	ND		0.36 C			No	IFD
120-83-2	2,4-Dichlorophenol	–		–		µg/L		0/2	10–10	ND		11 N			No	IFD
105-67-9	2,4-Dimethylphenol	–		–		µg/L		0/2	10–10	ND		73 N			No	IFD
51-28-5	2,4-Dinitrophenol	–		–		µg/L		0/2	10–25	ND		7.3 N			No	IFD
121-14-2	2,4-Dinitrotoluene	–		–		µg/L		0/2	10–10	ND		7.3 N			No	IFD
606-20-2	2,6-Dinitrotoluene	–		–		µg/L		0/2	10–10	ND		3.6 N			No	IFD
91-58-7	2-Chloronaphthalene	–		–		µg/L		0/2	10–10	ND		49 N			No	IFD
95-57-8	2-Chlorophenol	–		–		µg/L		0/2	10–10	ND		3 N			No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol	–		–		µg/L		0/2	25–25	ND		N/A			No	IFD
95-48-7	2-Methylphenol	–		–		µg/L		0/2	10–10	ND		180 N			No	IFD
88-74-4	2-Nitroaniline	–		–		µg/L		0/2	25–25	ND		11 N			No	IFD
88-75-5	2-Nitrophenol	–		–		µg/L		0/2	10–10	ND		N/A			No	IFD
91-94-1	3,3'-Dichlorobenzidine	–		–		µg/L		0/2	10–10	ND		0.15 C			No	IFD
99-09-2	3-Nitroaniline	–		–		µg/L		0/2	25–25	ND		1.1 N			No	IFD
101-55-3	4-Bromophenyl-phenyl ether	–		–		µg/L		0/2	10–10	ND		N/A			No	IFD
59-50-7	4-Chloro-3-methylphenol	–		–		µg/L		0/2	10–10	ND		N/A			No	IFD
106-47-8	4-Chloroaniline	–		–		µg/L		0/2	10–10	ND		15 N			No	IFD
7005-72-3	4-Chlorophenyl-phenyl ether	–		–		µg/L		0/2	10–10	ND		N/A			No	IFD

Table 2.7
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
106-44-5	4-Methylphenol	–		–		µg/L		0/2	10–10	ND		18 N			No	IFD
100-01-6	4-Nitroaniline	–		–		µg/L		0/2	25–25	ND		3.2 C			No	IFD
100-02-7	4-Nitrophenol	–		–		µg/L		0/2	25–25	ND		29 N			No	IFD
111-91-1	bis[2-chloroethoxy]methane	–		–		µg/L		0/2	10–10	ND		N/A			No	IFD
111-44-4	bis[2-chloroethyl]ether	–		–		µg/L		0/2	10–10	ND		0.01 C			No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	–		–		µg/L		0/2	10–10	ND		4.8 C	6.0	MCL	No	IFD
85-68-7	Butylbenzyl phthalate	–		–		µg/L		0/2	10–10	ND		730 N			No	IFD
86-74-8	Carbazole	–		–		µg/L		0/2	10–10	ND		3.4 C			No	IFD
132-64-9	Dibenzofuran	–		–		µg/L		0/2	10–10	ND		1.2 N			No	IFD
84-66-2	Diethyl phthalate	–		–		µg/L		0/2	10–10	ND		2900 N			No	IFD
131-11-3	Dimethyl phthalate	–		–		µg/L		0/2	10–10	ND		36000 N			No	IFD
84-74-2	Di-n-butyl phthalate	–		–		µg/L		0/2	10–10	ND		360 N			No	IFD
117-84-0	Di-n-octyl phthalate	–		–		µg/L		0/2	10–10	ND		150 N			No	IFD
118-74-1	Hexachlorobenzene	–		–		µg/L		0/2	10–10	ND		0.042 C	1.0	MCL	No	IFD
87-68-3	Hexachlorobutadiene	–		–		µg/L		0/2	10–10	ND		0.86 C			No	IFD
77-47-4	Hexachlorocyclopentadiene	–		–		µg/L		0/2	10–10	ND		22 N	50	MCL	No	IFD
67-72-1	Hexachloroethane	–		–		µg/L		0/2	10–10	ND		3.6 N			No	IFD
78-59-1	Isophorone	–		–		µg/L		0/2	10–10	ND		71 C			No	IFD
98-95-3	Nitrobenzene	–		–		µg/L		0/2	10–10	ND		0.34 N			No	IFD
621-64-7	N-nitroso-di-n-propylamine	–		–		µg/L		0/2	10–10	ND		0.0096 C			No	IFD
86-30-6	N-nitrosodiphenylamine	–		–		µg/L		0/2	10–10	ND		14 C			No	IFD
87-86-5	Pentachlorophenol	–		–		µg/L		0/2	25–25	ND		0.56 C	1.0	MCL	No	IFD
108-95-2	Phenol	–		–		µg/L		0/2	10–10	ND		1100 N			No	IFD
71-55-6	1,1,1-Trichloroethane	–		–		µg/L		0/2	10–10	ND		320 N	200	MCL	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane	–		–		µg/L		0/2	10–10	ND		0.055 C			No	IFD
79-00-5	1,1,2-Trichloroethane	–		–		µg/L		0/2	10–10	ND		0.2 C	5.0	MCL	No	IFD
75-34-3	1,1-Dichloroethane	–		–		µg/L		0/2	10–10	ND		81 N			No	IFD
75-35-4	1,1-Dichloroethene	–		–		µg/L		0/2	10–10	ND		34 C	7.0	MCL	No	IFD
107-06-2	1,2-Dichloroethane	–		–		µg/L		0/2	10–10	ND		0.12 C	5.0	MCL	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)	–		–		µg/L		0/2	10–10	ND		6.1 N[f]	70	MCL	No	IFD
78-87-5	1,2-Dichloropropane	–		–		µg/L		0/2	10–10	ND		0.16 C	5.0	MCL	No	IFD
78-93-3	2-Butanone	–		–		µg/L		0/2	10–10	ND		700 N			No	IFD
591-78-6	2-Hexanone	–		–		µg/L		0/2	10–10	ND		N/A			No	IFD
108-10-1	4-Methyl-2-pentanone	–		–		µg/L		0/2	10–10	ND		200 N			No	IFD
67-64-1	Acetone	–		–		µg/L		0/2	10–10	ND		550 N			No	IFD
71-43-2	Benzene	–		–		µg/L		0/2	10–10	ND		0.35 C	5.0	MCL	No	IFD
75-27-4	Bromodichloromethane	–		–		µg/L		0/2	10–10	ND		0.18 C			No	IFD
75-25-2	Bromoform	–		–		µg/L		0/2	10–10	ND		8.5 C			No	IFD
74-83-9	Bromomethane	–		–		µg/L		0/2	10–10	ND		0.87 N			No	IFD
75-15-0	Carbon disulfide	–		–		µg/L		0/2	10–10	ND		100 N			No	IFD
56-23-5	Carbon tetrachloride	–		–		µg/L		0/2	10–10	ND		0.17 C			No	IFD
108-90-7	Chlorobenzene	–		–		µg/L		0/2	10–10	ND		11 N	100	MCL	No	IFD
67-66-3	Chloroform	–		–		µg/L		0/2	10–10	ND		0.17 N			No	IFD
74-87-3	Chloromethane	–		–		µg/L		0/2	10–10	ND		16 C			No	IFD
10061-01-5	cis-1,3-Dichloropropene	–		–		µg/L		0/2	10–10	ND		0.4 C			No	IFD
124-48-1	Dibromochloromethane	–		–		µg/L		0/2	10–10	ND		0.13 C			No	IFD
100-41-4	Ethylbenzene	–		–		µg/L		0/2	10–10	ND		130 C	700	MCL	No	IFD
75-09-2	Methylene chloride	–		–		µg/L		0/2	10–10	ND		4.3 C			No	IFD
100-42-5	Styrene	–		–		µg/L		0/2	10–10	ND		160 N			No	IFD
127-18-4	Tetrachloroethene	–		–		µg/L		0/2	10–10	ND		0.1 C	5.0	MCL	No	IFD
108-88-3	Toluene	–		–		µg/L		0/2	10–10	ND		72 N	1000	MCL	No	IFD
10061-02-6	trans-1,3-Dichloropropene	–		–		µg/L		0/2	10–10	ND		0.4 C			No	IFD
79-01-6	Trichloroethene	–		–		µg/L		0/2	10–10	ND		0.028 C	5.0	MCL	No	IFD
75-01-4	Vinyl chloride	–		–		µg/L		0/2	10–10	ND		0.02 C	2.0	MCL	No	IFD
1330-20-7	Xylene isomers (total)	–		–		µg/L		0/2	10–10	ND		21 N	10000	MCL	No	IFD

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	PAHs															
91-57-6	2-Methylnaphthalene	–		–		µg/L		0/2	10–10	ND		0.62 N [g]			No	IFD
83-32-9	Acenaphthene	–		–		µg/L		0/2	10–10	ND		37 N			No	IFD
208-96-8	Acenaphthylene	–		–		µg/L		0/2	10–10	ND		0.62 N [g]			No	IFD
120-12-7	Anthracene	–		–		µg/L		0/2	10–10	ND		180 N			No	IFD
56-55-3	Benz[a]anthracene	–		–		µg/L		0/2	10–10	ND		0.092 C	0.2	MCL	No	IFD
50-32-8	Benzo[a]pyrene	–		–		µg/L		0/2	10–10	ND		0.0092 C			No	IFD
205-99-2	Benzo[b]fluoranthene	–		–		µg/L		0/2	10–10	ND		0.092 C			No	IFD
191-24-2	Benzo[ghi]perylene	–		–		µg/L		0/2	10–10	ND		0.62 N [g]			No	IFD
207-08-9	Benzo[k]fluoranthene	–		–		µg/L		0/2	10–10	ND		0.92 C			No	IFD
218-01-9	Chrysene	–		–		µg/L		0/2	10–10	ND		9.2 C			No	IFD
53-70-3	Dibenz[a,h]anthracene	–		–		µg/L		0/2	10–10	ND		0.0092 C			No	IFD
206-44-0	Fluoranthene	–		–		µg/L		0/2	10–10	ND		150 N			No	IFD
86-73-7	Fluorene	–		–		µg/L		0/2	10–10	ND		24 N			No	IFD
193-39-5	Indeno[1,2,3-cd]pyrene	–		–		µg/L		0/2	10–10	ND		0.092 C			No	IFD
91-20-3	Naphthalene	–		–		µg/L		0/2	10–10	ND		0.62 N			No	IFD
85-01-8	Phenanthrene	–		–		µg/L		0/2	10–10	ND		18 N [h]			No	IFD
129-00-0	Pyrene	–		–		µg/L		0/2	10–10	ND		18 N			No	IFD

Note: All results reported as unfiltered.
For the purposes of screening, field replicates have been averaged.

– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
J - estimated value
MCL - maximum contaminant level
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
ND - not detected
TT - Treatment technique action level
PAH - polycyclic aromatic hydrocarbon
PRG - preliminary remediation goal
Q - qualifier
TBC - to be considered

Rationale Codes:
Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically
Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Screening toxicity values for surface water are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.

[b] This default non-carcinogenic screening value for chromium is that for chromium(VI).

[c] Consistent with EPA model inputs for for lead, screening was based on the mean concentration of 7.1 µg/L rather than a maximum value.

[d] This default non-carcinogenic screening value for mercury is that for methylmercury.

[e] Methylmercury is included as a CoPC at the request of the New Jersey Department of Environmental Protection and U.S. EPA Region II reviewers.

[f] This default non-carcinogenic screening value is that for *cis*-1,2-dichloroethene.

[g] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.

[h] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.8
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater
Exposure Point:	Groundwater sitewide

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
	INORGANIC ANALYTES															
7440-36-0	Antimony	-		-		µg/L		0/12	3.4- 3.4	ND	N/A	1.5 N	6.0	MCL	No	IFD
7440-38-2	Arsenic	2.6		41.5		µg/L	MW-2	8/43	2.23- 6.67	41.5	N/A	0.045 C	50	MCL	Yes	ASL
7440-39-3	Barium	22.7		1100		µg/L	MW-2	42/43	20- 20	1100	N/A	260 N	2000	MCL	**Yes**	ASL
7440-41-7	Beryllium	0.52		0.61		µg/L	MW-2	2/12	0.25- 0.85	0.61	N/A	7.3 N	4.0	MCL	No	BSL
7440-43-9	Cadmium	0.831		5.7		µg/L	MW-2	15/43	0.21- 0.62	5.7	N/A	1.8 N	5.0	MCL	**Yes**	ASL
7440-70-2	Calcium	49900		568000		µg/L	MW-2	12/12	-	568000	N/A	N/A			No	NTX
7440-47-3	Chromium	0.27		9.7		µg/L	MW-2	15/27	0.22- 1.4	9.7	N/A	11 N [b]	100	MCL	No	BSL
7440-48-4	Cobalt	0.94		3.9		µg/L	MW-2	10/12	0.88- 0.88	3.9	N/A	73 N			No	BSL
7440-50-8	Copper	1.7		356		µg/L	MW-2	10/43	1.5- 20	356	N/A	150 N	1300	TT	**Yes**	ASL
7439-92-1	Lead	1		13.9		µg/L	MW-2	9/43	0.99- 5.2	13.9	N/A	15 MCL	15	TT	No	BSL
7439-95-4	Magnesium	8130		87500		µg/L	MW-2	12/12	-	87500	N/A	N/A			No	NTX
7439-96-5	Manganese	7.2		6580		µg/L	MW-2	42/43	10- 10	6580	N/A	88 N			**Yes**	ASL
7439-97-6	Mercury (total)	0.01084		54.243		µg/L	MW-2	39/46	0.2- 0.2	54.243	N/A	0.36 N [c]	2.0	MCL	**Yes**	ASL
22967-92-6	Methylmercury	0.12		32.73		ng/L	MW-3	27/27	-	32.73	N/A	360 N			**Yes**	HIST [d]
7440-02-0	Nickel	2		115	*J*	µg/L	MW-2	20/43	1.1- 40	115	N/A	73 N			**Yes**	ASL
7440-09-7	Potassium	1140	*J*	32800	*J*	µg/L	MW-2	12/12	-	32800	N/A	N/A			No	NTX
7782-49-2	Selenium	2.94	*J*	13.4		µg/L	MW-2	6/27	2.4- 3.8	13.4	N/A	18 N	50	MCL	No	BSL
7440-22-4	Silver	-		-		µg/L		0/27	0.67- 1.84	ND	N/A	18 N			No	IFD
7440-23-5	Sodium	31700		484000	*J*	µg/L	MW-2	12/12	-	484000	N/A	N/A			No	NTX
7440-28-0	Thallium	0.297		13.5		µg/L	MW-2	5/43	0.2- 10.3	13.5	N/A	0.24 N	2.0	MCL	**Yes**	ASL
7440-62-2	Vanadium	2.3		62.9		µg/L	MW-2	11/28	1.6- 50	62.9	N/A	3.6 N			**Yes**	ASL
7440-66-6	Zinc	12.5		803		µg/L	MW-2	19/27	9.6- 17.8	803	N/A	1100 N			No	BSL
	ORGANIC ANALYTES															
	Petroleum hydrocarbons	0.5		3.6		mg/L	MW-2	2/27	0.5- 0.5	3.6		N/A			No	NTX
120-82-1	1,2,4-Trichlorobenzene	-		-		µg/L		0/13	10- 400	ND		7.2 N	70	MCL	No	IFD
95-50-1	1,2-Dichlorobenzene	1		1		µg/L	MW-2	1/13	10- 400	1		37 N	600	MCL	No	BSL
541-73-1	1,3-Dichlorobenzene	-		-		µg/L		0/13	10- 400	ND		18 N			No	IFD
106-46-7	1,4-Dichlorobenzene	3		4		µg/L	MW-1	2/13	10- 400	4		0.5 C	75	MCL	**Yes**	ASL
108-60-1	2,2'-Oxybis[1-chloropropane]	-		-		µg/L		0/13	10- 400	ND		0.27 C			No	IFD
95-95-4	2,4,5-Trichlorophenol	-		-		µg/L		0/13	10- 1000	ND		360 N			No	IFD
88-06-2	2,4,6-Trichlorophenol	-		-		µg/L		0/13	10- 400	ND		0.36 N			No	IFD
120-83-2	2,4-Dichlorophenol	-		-		µg/L		0/13	10- 400	ND		11 N			No	IFD
105-67-9	2,4-Dimethylphenol	-		-		µg/L		0/13	10- 400	ND		73 N			No	IFD
51-28-5	2,4-Dinitrophenol	-		-		µg/L		0/13	25- 1000	ND		7.3 N			No	IFD
121-14-2	2,4-Dinitrotoluene	-		-		µg/L		0/13	10- 400	ND		7.3 N			No	IFD
606-20-2	2,6-Dinitrotoluene	-		-		µg/L		0/13	10- 400	ND		3.6 N			No	IFD
91-58-7	2-Chloronaphthalene	-		-		µg/L		0/13	10- 400	ND		49 N			No	IFD
95-57-8	2-Chlorophenol	-		-		µg/L		0/13	10- 400	ND		3 N			No	IFD
534-52-1	2-Methyl-4,6-dinitrophenol	-		-		µg/L		0/13	25- 1000	ND		N/A			No	IFD
95-48-7	2-Methylphenol	-		-		µg/L		0/13	10- 400	ND		180 N			No	IFD
88-74-4	2-Nitroaniline	-		-		µg/L		0/13	25- 1000	ND		11 N			No	IFD

Table 2.8
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
88-75-5	2-Nitrophenol	-		-		µg/L		0/13	10- 400	ND		N/A N			No	IFD
91-94-1	3,3'-Dichlorobenzidine	-		-		µg/L		0/13	10- 400	ND		0.15 C			No	IFD
99-09-2	3-Nitroaniline	-		-		µg/L		0/13	25- 1000	ND		1.1 N			No	IFD
101-55-3	4-Bromophenyl-phenyl ether	-		-		µg/L		0/13	10- 400	ND		N/A			No	IFD
59-50-7	4-Chloro-3-methylphenol	-		-		µg/L		0/13	10- 400	ND		N/A			No	IFD
106-47-8	4-Chloroaniline	-		-		µg/L		0/13	10- 400	ND		15 N			No	IFD
7005-72-3	4-Chlorophenyl-phenyl ether	-		-		µg/L		0/13	10- 400	ND		N/A			No	IFD
106-44-5	4-Methylphenol	2		62		µg/L	MW-1	2/13	10- 10	62		18 N			**Yes**	ASL
100-01-6	4-Nitroaniline	-		-		µg/L		0/13	25- 1000	ND		3.2 C			No	IFD
100-02-7	4-Nitrophenol	-		-		µg/L		0/13	25- 1000	ND		29			No	IFD
100-51-6	Benzyl alcohol	-		-		µg/L		0/1	10- 10	ND		1100 N			No	IFD
111-91-1	bis[2-chloroethoxy]methane	-		-		µg/L		0/13	10- 400	ND		N/A			No	IFD
111-44-4	bis[2-chloroethyl]ether	-		-		µg/L		0/13	10- 400	ND		0.01 C			No	IFD
117-81-7	bis[2-Ethylhexyl]phthalate	2		2		µg/L	MW-1	1/13	10- 400	2		4.8 C	6.0	MCL	No	BSL
85-68-7	Butylbenzyl phthalate	-		-		µg/L		0/13	10- 400	ND		730 N			No	IFD
86-74-8	Carbazole	-		-		µg/L		0/13	10- 400	ND		3.4 C			No	IFD
132-64-9	Dibenzofuran	-		-		µg/L		0/13	10- 400	ND		1.2 N			No	IFD
84-66-2	Diethyl phthalate	-		-		µg/L		0/13	10- 400	ND		2900 N			No	IFD
131-11-3	Dimethyl phthalate	-		-		µg/L		0/13	10- 400	ND		36000 N			No	IFD
84-74-2	Di-n-butyl phthalate	-		-		µg/L		0/13	10- 400	ND		360 N			No	IFD
117-84-0	Di-n-octyl phthalate	-		-		µg/L		0/13	10- 400	ND		150 N			No	IFD
118-74-1	Hexachlorobenzene	-		-		µg/L		0/13	10- 400	ND		0.042 C	1.0	MCL	No	IFD
87-68-3	Hexachlorobutadiene	-		-		µg/L		0/13	10- 400	ND		0.86 C			No	IFD
77-47-4	Hexachlorocyclopentadiene	-		-		µg/L		0/13	10- 400	ND		22 N	50	MCL	No	IFD
67-72-1	Hexachloroethane	-		-		µg/L		0/13	10- 400	ND		3.6 N			No	IFD
78-59-1	Isophorone	-		-		µg/L		0/13	10- 400	ND		71 C			No	IFD
98-95-3	Nitrobenzene	-		-		µg/L		0/13	10- 400	ND		0.34 N			No	IFD
62-75-9	N-nitroso dimethylamine	-		-		µg/L		0/1	10- 10	ND		0.0013 C			No	IFD
621-64-7	N-nitroso-di-n-propylamine	-		-		µg/L		0/13	10- 400	ND		0.0096 C			No	IFD
86-30-6	N-nitrosodiphenylamine	-		-		µg/L		0/13	10- 400	ND		14 C			No	IFD
87-86-5	Pentachlorophenol	-		-		µg/L		0/13	10- 1000	ND		0.56 C	1.0	MCL	No	IFD
108-95-2	Phenol	-		-		µg/L		0/13	10- 400	ND		1100 N			No	IFD
71-55-6	1,1,1-Trichloroethane	-		-		µg/L		0/12	10- 10	ND		320 N	200	MCL	No	IFD
79-34-5	1,1,2,2-Tetrachloroethane	-		-		µg/L		0/12	10- 25	ND		0.055 C			No	IFD
79-00-5	1,1,2-Trichloroethane	-		-		µg/L		0/12	10- 10	ND		0.2 C	5.0	MCL	No	IFD
75-34-3	1,1-Dichloroethane	-		-		µg/L		0/12	10- 10	ND		81 N			No	IFD
75-35-4	1,1-Dichloroethene	-		-		µg/L		0/12	10- 10	ND		34 N	7.0	MCL	No	IFD
107-06-2	1,2-Dichloroethane	-		-		µg/L		0/12	10- 10	ND		0.12 C	5.0	MCL	No	IFD
540-59-0	1,2-Dichloroethene isomers (total)	2		45		µg/L	MW-2	2/12	10- 10	45		6.1 N [e]	70	MCL	**Yes**	ASL
78-87-5	1,2-Dichloropropane	-		-		µg/L		0/12	10- 10	ND		0.16 C	5.0	MCL	No	IFD
78-93-3	2-Butanone	26	*J*	26	*J*	µg/L	MW-2	1/12	10- 10	26		700 N			No	BSL
591-78-6	2-Hexanone	-		-		µg/L		0/12	10- 10	ND		N/A			No	IFD
108-10-1	4-Methyl-2-pentanone	31		31		µg/L	MW-1	1/12	10- 10	31		200 N			No	BSL
67-64-1	Acetone	100	*J*	100	*J*	µg/L	MW-2	1/12	10- 150	100		550 N			No	BSL
71-43-2	Benzene	1.2		140		µg/L	MW-2	8/27	1- 10	140		0.35 C	5.0	MCL	**Yes**	ASL
75-27-4	Bromodichloromethane	-		-		µg/L		0/12	10- 10	ND		0.18 C			No	IFD
75-25-2	Bromoform	-		-		µg/L		0/12	10- 10	ND		8.5 C			No	IFD
74-83-9	Bromomethane	-		-		µg/L		0/12	10- 10	ND		0.87 N			No	IFD

Table 2.8
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection
75-15-0	Carbon disulfide	16		16		µg/L	MW-2	1/12	10- 10	16		100 N			No	BSL
56-23-5	Carbon tetrachloride	-		-		µg/L		0/12	10- 10	ND		0.17 C			No	IFD
108-90-7	Chlorobenzene	1.9		28		µg/L	MW-1	8/27	4- 10	28		11 N	100	MCL	**Yes**	ASL
75-00-3	Chloroethane	20	*J*	20	*J*	µg/L	MW-2	1/12	10- 10	20		4.6 C			**Yes**	ASL
67-66-3	Chloroform	-		-		µg/L		0/12	10- 10	ND		0.17 N			No	IFD
74-87-3	Chloromethane	-		-		µg/L		0/12	10- 10	ND		16 C			No	IFD
10061-01-5	cis-1,3-Dichloropropene	-		-		µg/L		0/12	10- 10	ND		0.4 C			No	IFD
124-48-1	Dibromochloromethane	-		-		µg/L		0/12	10- 10	ND		0.13 C			No	IFD
100-41-4	Ethylbenzene	120		120		µg/L	MW-1	1/12	10- 10	120		130 N[f]	700	MCL	No	BSL
136777-61-2	meta & para Xylenes	51		51		µg/L	MW-1	1/15	5- 5	51		21 N			**Yes**	ASL
75-09-2	Methylene chloride	-		-		µg/L		0/12	10- 10	ND		4.3 C			No	IFD
95-47-6	ortho-Xylene	22		22		µg/L	MW-2	1/15	5- 5	22		21 N			**Yes**	ASL
100-42-5	Styrene	-		-		µg/L		0/12	10- 10	ND		160 N			No	IFD
127-18-4	Tetrachloroethene	-		-		µg/L		0/12	10- 10	ND		0.1 C	5.0	MCL	No	IFD
108-88-3	Toluene	330		1700		µg/L	MW-1	2/27	5- 10	1700		72 N	1000	MCL	**Yes**	ASL
10061-02-6	trans-1,3-Dichloropropene	-		-		µg/L		0/12	10- 10	ND		0.4 C			No	IFD
79-01-6	Trichloroethene	-		-		µg/L		0/12	10- 10	ND		0.028 C	5.0	MCL	No	IFD
75-01-4	Vinyl chloride	-		-		µg/L		0/12	10- 10	ND		0.02 C	2.0	MCL	No	IFD
1330-20-7	Xylene isomers (total)	390		390		µg/L	MW-1	1/12	10- 10	390		21 N	10000	MCL	**Yes**	ASL
	PAHs															
91-57-6	2-Methylnaphthalene	1		1		µg/L	MW-2	2/13	10- 400	1		0.62 N[g]			**Yes**	ASL
83-32-9	Acenaphthene	2		2		µg/L	MW-2	1/13	10- 400	2		37 N			No	BSL
208-96-8	Acenaphthylene	-		-		µg/L		0/13	10- 400	ND		0.62 N[g]			No	IFD
120-12-7	Anthracene	-		-		µg/L		0/13	10- 400	ND		180 N			No	IFD
56-55-3	Benz[a]anthracene	-		-		µg/L		0/13	10- 400	ND		0.092 C	0.2	MCL	No	IFD
50-32-8	Benzo[a]pyrene	-		-		µg/L		0/13	10- 400	ND		0.0092 C			No	IFD
205-99-2	Benzo[b]fluoranthene	-		-		µg/L		0/13	10- 400	ND		0.092 C			No	IFD
191-24-2	Benzo[ghi]perylene	-		-		µg/L		0/13	10- 400	ND		0.62 N[g]			No	IFD
207-08-9	Benzo[k]fluoranthene	-		-		µg/L		0/13	10- 400	ND		0.92 C			No	IFD
218-01-9	Chrysene	-		-		µg/L		0/13	10- 400	ND		9.2 C			No	IFD
53-70-3	Dibenz[a,h]anthracene	-		-		µg/L		0/13	10- 400	ND		0.0092 C			No	IFD
206-44-0	Fluoranthene	-		-		µg/L		0/13	10- 400	ND		150 N			No	IFD
86-73-7	Fluorene	-		-		µg/L		0/13	10- 400	ND		24 N			No	IFD
193-39-5	Indeno[1,2,3-cd]pyrene	-		-		µg/L		0/13	10- 400	ND		0.092 C			No	IFD
91-20-3	Naphthalene	9		100		µg/L	MW-2	2/13	10- 10	100		0.62 N			**Yes**	ASL
85-01-8	Phenanthrene	-		-		µg/L		0/13	10- 400	ND		18 N[h]			No	IFD
129-00-0	Pyrene	-		-		µg/L		0/13	10- 400	ND		18 N			No	IFD

Note: All results reported as unfiltered.
For the purposes of screening, field replicates have been averaged.

– - either no detected or undetected values
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
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Rationale Codes:
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Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

CAS Registry Number	Analyte	Minimum detected value	*Q*	Maximum detected value	*Q*	Concen-tration units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]	Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Substance Deletion or Selection

ND - not detected
TT - Treatment technique action level
PAH - polycyclic aromatic hydrocarbon
PRG - preliminary remediation goal
Q - qualifier
TBC - to be considered

[a] Screening toxicity values for groundwater are the PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.
[b] This default non-carcinogenic screening value for chromium is that for chromium(VI).
[c] This default non-carcinogenic screening value for mercury is that for methylmercury.
[d] Methylmercury is included as a CoPC at the request of the New Jersey Department of Environmental Protection and U.S. EPA Region II reviewers.
[e] This default non-carcinogenic screening value is that for *cis* -1,2-dichloroethene.
[f] Screened based on RfD and RFC verified in IRIS. Region 9 provides a screening value of 2.9 µg/L based on NCEA carcinogenicity data.
[g] This default screening value is that for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.
[h] Based on the risk-based concentration for pyrene. There is no EPA-derived toxicity value for phenanthrene. NJDEP and EPA indicated that the toxicity value for pyrene should be applied (NJDEP 2001).

Table 2.9
Occurrence, distribution and selection of chemicals of potential concern
Ventron/Velsicol Site OU1

Scenario Timeframe	Current/Future
Medium:	Soil
Exposure Medium:	Air
Exposure Point:	Outdoor air

CAS Registry Number	Analyte	Minimum detected value	Q	Maximum detected value	Q	Concen-tration units	Location of Maximum Concen-tration	Detection Frequency	Range of Detection Limits	Concen-tration Used for Screening	Background Value	Screening Toxicity Values[a]		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	CoPC Flag	Rationale for Contaminant Deletion or Selection
Indoor Air																	
	Mercury Vapor	11.0		30.4		ng/m³	A1	5/5	–	30.4	N/A	31	N			No	BSL
Outdoor Air																	
	Mercury Vapor	1.42		60.6		ng/m³	A4	11/11	–	60.6	N/A	31	N			**Yes**	ASL

Note: All results reported as dry weight.

– - no undetected value
ARAR - applicable or relevant and appropriate requirement
C - carcinogenic based on a cancer risk of 1×10^{-6}
CoPC - chemical of potential concern
N - noncarcinogenic based on hazard quotient of 0.1
N/A - not applicable
PRG - preliminary remediation goal
Q - qualifier
TBC - to be considered

Rationale Codes:

Selection Reason:
ASL - above screening levels
HIST - infrequent detection but associated historically

Deletion Reason:
BKG - below or consistent with background levels
BSL - below screening level
IFD - infrequent detection
NTX - no toxicity information
NUT - essential nutrient

[a] Screening toxicity values for air are the ambient air PRGs taken from U.S. EPA Region IX (2005a). PRGs correspond to 1×10^{-6} or a hazard quotient of 0.1, whichever is lower.

Table 2.10. Relative contribution of inhalation of chemicals in outdoor air exposure pathway to risk-based concentrations for CoPCs in soil

	EPA Region 9 Residential Soil PRG				Maximum Soil/Sediment	
Chemical	Inhalation	Dermal	Ingestion	Combined	Subsurface	Surface soil/sedt
Metals						
Antimony			31.3	31.3	97.3	53.7
Arsenic	588	4.5	0.43	0.39	120	26.4
Barium	294,086		5,475	5,375	11,200	12,000
Cadmium	1,405			1,404	36.1	31.1
Chromium (as Chromium VI)	30.1			30.1	9,840	8,230
Cobalt	903			903	42.5	14.4
Copper			3,129	3,129	8,720	7,420
Lead[a]				400	58,200	4,320
Manganese	28,820		1,877	1,762	23,300	3,090
Mercury (total, as methylmercury)[b]		27.9	7.8	6.1	34,700	13,800
Methylmercury		27.9	7.8	6.1	7.4	0.32
Nickel (refinery dust)	10,534			10,534	317	193
Selenium			391	391	42.8	2.0
Silver			391	391	1,580	93.8
Thallium			5.2	5.2	12.9	21.9
Vanadium			78.0	78.0	980	245
Zinc			23,464	23,463	43,200	188,000
Organics						
Acetone	17,674		70,393	14,127	0.22	12.0
Benzene	0.68		11.6	0.64	2.8	2.8
bis[2-ethylhexyl]phthalate	632,026	145	45.7	34.7	22	380
Carbazole	442,418	101	32.0	24.3	25	0.93
Chlorobenzene	167		1,564	151	0.010	0.0012
1,2-Dichloroethene, isomers[c]	45.4		782	42.9	ND	ND
1,4-Dichlorobenzene	4.0		26.7	3.4	0.20	ND
Dibenzofuran	2035		156	145	16	0.64
Ethylbenzene	2,448		7,821	1,864	0.91	ND
4-Methyl-2-pentanone	33,848		6,257	5,281	ND	0.87
4-Methyl phenol	10,293,000	1,397	391	306	0.41	ND
Toluene	685		15,643	656	70	7.0
Xylene isomers (total)	277	55,867	15,643	271	110	5.1
PAHs						
2-Methylnaphthalene[d]	58.0		1,564	55.9	11	15.0
Benz[a]anthracene	12,121	2.13	0.88	0.62	62	4.0
Benzo[a]pyrene	1,212	0.21	0.088	0.062	52	10
Benzo[b]fluoranthene	12,121	2.13	0.88	0.62	64	13
Benzo[k]fluoranthene	121,211	21	8.8	6.2	16	4.7
Chrysene	1,212,105	213	88	62	61	12
Dibenz[a,h]anthracene	1,212	0.21	0.088	0.062	1.3	0.90
Fluoranthene	82,344,000	8,595	3,129	2,294	130	26
Indeno[1,2,3-cd]pyrene	12,121	2.1	0.88	0.62	20	2.6
Naphthalene	58.0		1,564	55.9	22	120
PCBs	4,424	0.72	0.32	0.22	5.2	4.4

Note: All values in mg/kg.

Box indicates the maximum value exceeds the inhalation risk-based concentration for that analyte.

[a] Lead screening value based on the IEUBK lead model.

[b] Excluding the outlier concentrations of 13,800 mg/kg in developed area surface soils and 295,000 mg/kg in undeveloped area surface soils.

[c] These non-carcinogenic screening value are those for *cis* -1,2-dichloroethene.

[d] These screening values are those for naphthalene, the noncarcinogenic PAH with the most stringent risk-based concentration/PRG.

Table 3.1
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface soil
Exposure Point:	Developed Area surface soil

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Current (unpaved)												
Arsenic	mg/kg	5.7E+00	n<10	1.1E+01		mg/kg	1.1E+01	Max	n<10	1.1E+01	Max	n<10
Chromium	mg/kg	4.2E+01	n<10	9.7E+01	*J*	mg/kg	9.7E+01	Max	n<10	9.7E+01	Max	n<10
Copper	mg/kg	1.9E+02	n<10	4.7E+02	*J*	mg/kg	4.7E+02	Max	n<10	4.7E+02	Max	n<10
Manganese	mg/kg	3.6E+02	n<10	5.4E+02	*J*	mg/kg	5.4E+02	Max	n<10	5.4E+02	Max	n<10
Mercury (total)	mg/kg	1.2E+02	n<10	3.1E+02		mg/kg	3.1E+02	Max	n<10	3.1E+02	Max	n<10
Vanadium	mg/kg	6.7E+01	n<10	1.4E+02		mg/kg	1.4E+02	Max	n<10	1.4E+02	Max	n<10
Benzo[a]pyrene	µg/kg	2.7E+02	n<10	4.1E+02		µg/kg	4.1E+02	Max	n<10	4.1E+02	Max	n<10
Benzo[b]fluoranthene	µg/kg	3.4E+02	n<10	7.5E+02		µg/kg	7.5E+02	Max	n<10	7.5E+02	Max	n<10
Dibenz[a,h]anthracene	µg/kg	1.5E+02	n<10	7.1E+01		µg/kg	7.1E+01	Max	n<10	7.1E+01	Max	n<10
Future (all)												
Arsenic	mg/kg	4.3E+00	6.2E+00	1.1E+01		mg/kg	6.2E+00	UCL-P	A	6.2E+00	UCL-P	A
Chromium	mg/kg	3.4E+01	5.9E+01	1.3E+02		mg/kg	7.6E+01	UCL-P	A	7.6E+01	UCL-P	A
Copper	mg/kg	6.5E+02	1.7E+03	7.4E+03		mg/kg	6.3E+03	UCL-N	A	6.3E+03	UCL-N	A
Manganese	mg/kg	2.6E+02	3.4E+02	5.4E+02	*J*	mg/kg	3.4E+02	UCL-P	A	3.4E+02	UCL-P	A
Mercury (total)[a]	mg/kg	6.9E+02	1.0E+03	2.3E+03		mg/kg	1.3E+03	UCL-P	A	1.3E+03	UCL-P	A
Thallium	mg/kg	1.2E+00	1.8E+00	5.4E+00		mg/kg	2.8E+00	UCL-N	A	2.8E+00	UCL-N	A
Vanadium	mg/kg	3.7E+01	n<10	1.4E+02		mg/kg	1.4E+02	Max	n<10	1.4E+02	Max	n<10
Benzene	µg/kg	2.9E+02	8.0E+02	2.8E+03	*J*	µg/kg	2.8E+03	Max	B	2.8E+03	Max	B
Benz[a]anthracene	µg/kg	5.0E+02	7.0E+02	1.4E+03		µg/kg	7.5E+02	UCL-P	A	7.5E+02	UCL-P	A
Benzo[a]pyrene	µg/kg	4.3E+02	5.7E+02	1.1E+03		µg/kg	5.7E+02	UCL-P	A	5.7E+02	UCL-P	A
Benzo[b]fluoranthene	µg/kg	5.3E+02	7.2E+02	1.4E+03		µg/kg	7.2E+02	UCL-P	A	7.2E+02	UCL-P	A
Dibenz[a,h]anthracene	µg/kg	1.2E+02	1.5E+02	1.5E+02		µg/kg	1.5E+02	Max	B	1.5E+02	Max	B

Notes: EPC - exposure point concentration
UCL - upper confidence limit

Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).

B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.

C - Mean detected concentration used for EPC in lead model (see text).

[a] Sample SS-04 with a concentration of 13,800 mg/kg was identified as a hot spot and excluded. Additional risk calculations also provided with hot spot value included.

Table 3.2
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil/sediment
Exposure Medium:	Surface soil/sediment
Exposure Point:	Undeveloped Area surface soil/sediment

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Soils												
Antimony	mg/kg	5.1E+00	8.2E+00	5.4E+01		mg/kg	1.3E+01	UCL-P	A	1.3E+01	UCL-P	A
Arsenic	mg/kg	7.1E+00	9.1E+00	2.6E+01		mg/kg	9.9E+00	UCL-P	A	9.9E+00	UCL-P	A
Barium	mg/kg	8.4E+02	1.6E+03	1.2E+04		mg/kg	5.1E+03	UCL-N	A	5.1E+03	UCL-N	A
Cadmium	mg/kg	4.1E+00	6.1E+00	3.1E+01		mg/kg	6.4E+00	UCL-P	A	6.4E+00	UCL-P	A
Chromium	mg/kg	3.5E+02	7.7E+02	8.2E+03		mg/kg	2.8E+03	UCL-N	A	2.8E+03	UCL-N	A
Copper	mg/kg	1.9E+02	2.6E+02	1.0E+03	*J*	mg/kg	2.8E+02	UCL-P	A	2.8E+02	UCL-P	A
Lead[a]	mg/kg	6.4E+02	4.6E+03	4.3E+03		mg/kg	6.4E+02	Mean	C	6.4E+02	Mean	C
Manganese	mg/kg	3.6E+02	5.3E+02	3.1E+03	*J*	mg/kg	5.1E+02	UCL-P	A	5.1E+02	UCL-P	A
Mercury (total)[a]	mg/kg	1.1E+02	1.6E+02	5.9E+02		mg/kg	1.8E+02	UCL-P	A	1.8E+02	UCL-P	A
Methylmercury	mg/kg	4.0E-02	n<10	3.2E-01		mg/kg	3.2E-01	Max	n<10	3.2E-01	Max	n<10
Nickel	mg/kg	3.6E+01	4.7E+01	1.9E+02		mg/kg	5.0E+01	UCL-P	A	5.0E+01	UCL-P	A
Silver	mg/kg	6.8E+00	1.2E+01	9.4E+01		mg/kg	2.2E+01	UCL-P	A	2.2E+01	UCL-P	A
Thallium	mg/kg	2.1E+00	3.5E+00	2.2E+01		mg/kg	1.0E+01	UCL-N	A	1.0E+01	UCL-N	A
Vanadium	mg/kg	4.6E+01	6.3E+01	2.5E+02		mg/kg	6.8E+01	UCL-P	A	6.8E+01	UCL-P	A
Zinc	mg/kg	8.3E+03	1.8E+04	1.9E+05		mg/kg	2.4E+04	UCL-P	A	2.4E+04	UCL-P	A
Aroclor® 1248	µg/kg	1.3E+03	n<10	4.4E+03		µg/kg	4.4E+03	Max	n<10	4.4E+03	Max	n<10
2-Methylnaphthalene	µg/kg	9.6E+02	1.9E+03	1.5E+04		µg/kg	6.3E+03	UCL-N	A	6.3E+03	UCL-N	A
Benz[a]anthracene	µg/kg	1.3E+03	2.0E+03	4.0E+03		µg/kg	2.4E+03	UCL-P	A	2.4E+03	UCL-P	A
Benzo[a]pyrene	µg/kg	1.5E+03	2.4E+03	1.0E+04		µg/kg	2.8E+03	UCL-P	A	2.8E+03	UCL-P	A
Benzo[b]fluoranthene	µg/kg	1.7E+03	2.7E+03	1.3E+04		µg/kg	3.2E+03	UCL-P	A	3.2E+03	UCL-P	A
bis[2-Ethylhexyl]phthalate	µg/kg	2.6E+04	5.4E+04	3.8E+05		µg/kg	1.9E+05	UCL-N	A	1.9E+05	UCL-N	A
Dibenz[a,h]anthracene	µg/kg	7.6E+02	1.5E+03	9.0E+02		µg/kg	9.0E+02	Max	B	9.0E+02	Max	B
Indeno[1,2,3-cd]pyrene	µg/kg	1.0E+03	1.8E+03	2.6E+03		µg/kg	1.7E+03	UCL-P	A	1.7E+03	UCL-P	A
Naphthalene	µg/kg	4.9E+03	1.2E+04	1.2E+05		µg/kg	4.9E+04	UCL-N	A	4.9E+04	UCL-N	A
Sediments												
Arsenic	mg/kg	5.0E+00	n<10	8.8E+00		mg/kg	8.8E+00	Max	n<10	8.8E+00	Max	n<10
Cadmium	mg/kg	3.7E+00	n<10	9.1E+00		mg/kg	9.1E+00	Max	n<10	9.1E+00	Max	n<10
Chromium	mg/kg	1.0E+02	n<10	1.6E+02		mg/kg	1.6E+02	Max	n<10	1.6E+02	Max	n<10
Mercury (total)	mg/kg	6.9E+02	n<10	1.3E+03		mg/kg	1.3E+03	Max	n<10	1.3E+03	Max	n<10
Methylmercury	mg/kg	6.3E-02	n<10	1.3E-01		mg/kg	1.3E-01	Max	n<10	1.3E-01	Max	n<10
Thallium	mg/kg	2.8E+00	n<10	4.8E+00		mg/kg	4.8E+00	Max	n<10	4.8E+00	Max	n<10
Vanadium	mg/kg	5.7E+01	n<10	6.9E+01		mg/kg	6.9E+01	Max	n<10	6.9E+01	Max	n<10
Zinc	mg/kg	1.4E+03	n<10	3.5E+03		mg/kg	3.5E+03	Max	n<10	3.5E+03	Max	n<10
Aroclor® 1248	µg/kg	2.2E+02	n<10	2.4E+02		µg/kg	2.4E+02	Max	n<10	2.4E+02	Max	n<10
Aroclor® 1260	µg/kg	3.8E+02	n<10	4.9E+02		µg/kg	4.9E+02	Max	n<10	4.9E+02	Max	n<10
Sum 1248 and 1260	µg/kg	5.9E+02	n<10	7.3E+02		µg/kg	7.3E+02	Max	n<10	7.3E+02	Max	n<10
Benz[a]anthracene	µg/kg	7.3E+02	n<10	1.7E+03		µg/kg	1.7E+03	Max	n<10	1.7E+03	Max	n<10
Benzo[a]pyrene	µg/kg	7.3E+02	n<10	1.6E+03		µg/kg	1.6E+03	Max	n<10	1.6E+03	Max	n<10

Table 3.2
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil/sediment
Exposure Medium:	Surface soil/sediment
Exposure Point:	Undeveloped Area surface soil/sediment

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo[b]fluoranthene	µg/kg	7.9E+02	n<10	1.8E+03		µg/kg	1.8E+03	Max	n<10	1.8E+03	Max	n<10
Dibenz[a,h]anthracene	µg/kg	2.0E+02	n<10	3.2E+02		µg/kg	3.2E+02	Max	n<10	3.2E+02	Max	n<10
Indeno[1,2,3-cd]pyrene	µg/kg	5.4E+02	n<10	1.2E+03		µg/kg	1.2E+03	Max	n<10	1.2E+03	Max	n<10

Notes: EPC - exposure point concentration
UCL - upper confidence limit
Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).

B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.

C - Mean detected concentration used for EPC in lead model (see text).

[a] Sample HS-6, with a concentration of 47,600 mg/kg, was identified as a hot spot and was excluded. Additional risk calculations also provided with hot spot value included.
[b] Sample HS-5, with a concentration of 295,000 mg/kg, was identified as a hot spot and was excluded. Additional risk calculations also provided with hot spot value included.

Table 3.3
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Subsurface soil
Exposure Point:	Developed Area subsurface soil (1-20 ft depths)

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	mg/kg	6.7E+00	n<10	9.9E+00		mg/kg	9.9E+00	Max	n<10	9.9E+00	Max	n<10
Barium	mg/kg	3.1E+02	n<10	8.2E+02		mg/kg	8.2E+02	Max	n<10	8.2E+02	Max	n<10
Chromium	mg/kg	4.6E+01	n<10	1.3E+02		mg/kg	1.3E+02	Max	n<10	1.3E+02	Max	n<10
Copper	mg/kg	1.7E+03	n<10	7.4E+03		mg/kg	7.4E+03	Max	n<10	7.4E+03	Max	n<10
Manganese	mg/kg	4.9E+02	n<10	8.1E+02		mg/kg	8.1E+02	Max	n<10	8.1E+02	Max	n<10
Mercury (total)	mg/kg	5.8E+02	9.8E+02	5.2E+03		mg/kg	2.9E+03	UCL-N	A	2.9E+03	UCL-N	A
Thallium	mg/kg	1.7E+00	n<10	5.4E+00		mg/kg	5.4E+00	Max	n<10	5.4E+00	Max	n<10
2-Methylnaphthalene[a]	µg/kg	1.1E+04	n<10	1.1E+04		µg/kg	1.1E+04	Max	n<10	1.1E+04	Max	n<10
Aroclor® 1260	µg/kg	3.6E+02	n<10	3.6E+02		µg/kg	3.6E+02	Max	n<10	3.6E+02	Max	n<10
Total PCBs (sum)	µg/kg	3.6E+02	n<10	3.6E+02		µg/kg	3.6E+02	Max	n<10	3.6E+02	Max	n<10
Benzene	µg/kg	7.5E+02	n<10	2.8E+03	*J*	µg/kg	2.8E+03	Max	n<10	2.8E+03	Max	n<10

Notes: EPC - exposure point concentration
UCL - upper confidence limit
Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).

B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.

C - Mean detected concentration used for EPC in lead model (see text).

[a] Subsurface soil concentrations for 2-methylnaphthalene in the developed area were evaluated based on data for the undeveloped area (EPC 2.4E+03 µg/kg) because of limited sampling data in the developed area. The UCL for the developed area would be 1.1E+4 µg/kg, which is the single sample result for the developed area.

Table 3.4
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Subsurface soil
Exposure Point:	Undeveloped Area subsurface soil (1-20 ft depths)

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Antimony	mg/kg	7.9E+00	1.2E+01	9.7E+01		mg/kg	1.1E+01	UCL-P	A	1.1E+01	UCL-P	A
Arsenic	mg/kg	1.4E+01	1.9E+01	1.2E+02		mg/kg	1.9E+01	UCL-P	A	1.9E+01	UCL-P	A
Barium	mg/kg	7.9E+02	1.2E+03	1.1E+04		mg/kg	1.9E+03	UCL-P	A	1.9E+03	UCL-P	A
Cadmium	mg/kg	5.7E+00	7.3E+00	3.6E+01		mg/kg	7.5E+00	UCL-P	A	7.5E+00	UCL-P	A
Chromium	mg/kg	2.9E+02	6.1E+02	9.8E+03		mg/kg	1.5E+03	UCL-N	A	1.5E+03	UCL-N	A
Copper	mg/kg	4.4E+02	7.3E+02	8.7E+03	*J*	mg/kg	1.5E+03	UCL-N	A	1.5E+03	UCL-N	A
Lead	mg/kg	2.1E+03	4.0E+03	5.8E+04		mg/kg	2.1E+03	Mean	C	2.1E+03	Mean	C
Manganese	mg/kg	7.8E+02	1.6E+03	2.3E+04	*J*	mg/kg	3.7E+03	UCL-N	A	3.7E+03	UCL-N	A
Mercury (total)	mg/kg	4.8E+02	1.1E+03	3.5E+04		mg/kg	7.3E+02	UCL-P	A	7.3E+02	UCL-P	A
Methylmercury	mg/kg	2.9E-03	n<10	7.4E-03		mg/kg	7.4E-03	Max	n<10	7.4E-03	Max	n<10
Nickel	mg/kg	6.3E+01	7.8E+01	3.2E+02		mg/kg	8.1E+01	UCL-P	A	8.1E+01	UCL-P	A
Selenium	mg/kg	2.1E+00	3.6E+00	4.3E+01		mg/kg	7.4E+00	UCL-N	A	7.4E+00	UCL-N	A
Silver	mg/kg	3.5E+01	8.7E+01	1.6E+03		mg/kg	2.4E+01	UCL-P	A	2.4E+01	UCL-P	A
Thallium	mg/kg	1.5E+00	2.3E+00	1.3E+01		mg/kg	4.2E+00	UCL-N	A	4.2E+00	UCL-N	A
Vanadium	mg/kg	6.6E+01	1.0E+02	9.8E+02		mg/kg	2.7E+02	UCL-N	A	2.7E+02	UCL-N	A
Zinc	mg/kg	2.3E+03	3.6E+03	4.3E+04		mg/kg	7.5E+03	UCL-N	A	7.5E+03	UCL-N	A
Aroclor® 1242	µg/kg	7.9E+02	n<10	7.9E+02		µg/kg	7.9E+02	Max	n<10	7.9E+02	Max	n<10
Aroclor® 1248	µg/kg	4.4E+03	n<10	4.4E+03		µg/kg	4.4E+03	Max	n<10	4.4E+03	Max	n<10
Aroclor® 1254	µg/kg	5.5E+02	n<10	5.5E+02		µg/kg	5.5E+02	Max	n<10	5.5E+02	Max	n<10
Total PCBs (sum)	µg/kg	4.4E+03	n<10	4.4E+03		µg/kg	4.4E+03	Max	n<10	4.4E+03	Max	n<10
2-Methylnaphthalene	µg/kg	4.2E+02	7.5E+02	8.8E+03		µg/kg	2.4E+03	UCL-N	A	2.4E+03	UCL-N	A
Benz[a]anthracene	µg/kg	2.2E+03	4.9E+03	6.2E+04		µg/kg	1.8E+04	UCL-N	A	1.8E+04	UCL-N	A
Benzo[a]pyrene	µg/kg	1.8E+03	4.0E+03	5.2E+04		µg/kg	1.5E+04	UCL-N	A	1.5E+04	UCL-N	A
Benzo[b]fluoranthene	µg/kg	2.4E+03	5.0E+03	6.4E+04		µg/kg	1.8E+04	UCL-N	A	1.8E+04	UCL-N	A
Benzo[ghi]perylene	µg/kg	7.8E+02	1.6E+03	1.9E+04		µg/kg	2.9E+03	UCL-N	A	2.9E+03	UCL-N	A
Benzo[k]fluoranthene	µg/kg	7.0E+02	1.4E+03	1.6E+04		µg/kg	2.5E+03	UCL-N	A	2.5E+03	UCL-N	A
Carbazole	µg/kg	8.7E+02	2.0E+03	2.5E+04		µg/kg	3.7E+03	UCL-N	A	3.7E+03	UCL-N	A
Dibenz[a,h]anthracene	µg/kg	2.1E+02	2.7E+02	1.3E+03		µg/kg	2.6E+02	UCL-P	A	2.6E+02	UCL-P	A
Dibenzofuran	µg/kg	6.1E+02	1.3E+03	1.6E+04		µg/kg	4.5E+03	UCL-N	A	4.5E+03	UCL-N	A
Indeno[1,2,3-cd]pyrene	µg/kg	8.2E+02	1.7E+03	2.0E+04		µg/kg	3.1E+03	UCL-N	A	3.1E+03	UCL-N	A
Naphthalene	µg/kg	8.0E+02	1.7E+03	2.2E+04		µg/kg	6.0E+03	UCL-N	A	6.0E+03	UCL-N	A
Toluene	µg/kg	2.2E+03	5.0E+03	7.0E+04		µg/kg	1.9E+04	UCL-N	A	1.9E+04	UCL-N	A
Xylenes	µg/kg	3.3E+03	8.0E+03	1.1E+05		µg/kg	3.1E+04	UCL-N	A	3.1E+04	UCL-N	A

Table 3.4
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Notes: EPC - exposure point concentration
UCL - upper confidence limit
Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).

B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.

C - Mean detected concentration used for EPC in lead model (see text).

Table 3.5
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Surface Water
Exposure Medium:	Surface Water
Exposure Point:	Undeveloped Area surface water

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Manganese	ug/L	2.9E+02	n<10	4.1E+02		ug/L	4.1E+02	Max	n<10	4.1E+02	Max	n<10
Mercury (total)	ug/L	5.0E+00	n<10	1.8E+01		ug/L	1.8E+01	Max	n<10	1.8E+01	Max	n<10
Methylmercury	ug/L	2.0E-03	n<10	2.8E-03		ug/L	2.8E-03	Max	n<10	2.8E-03	Max	n<10

Notes: EPC - exposure point concentration
UCL - upper confidence limit
Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).

B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.

C - Mean detected concentration used for EPC in lead model (see text).

Table 3.6
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater
Exposure Point:	Groundwater sitewide

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	ug/L	4.5E+00	6.4E+00	4.2E+01		ug/L	9.4E+00	UCL-N	A	9.4E+00	UCL-N	A
Barium	ug/L	3.4E+02	4.0E+02	1.1E+03		ug/L	4.2E+02	UCL-P	A	4.2E+02	UCL-P	A
Cadmium	ug/L	9.1E-01	1.2E+00	5.7E+00		ug/L	2.8E+00	UCL-N	A	2.8E+00	UCL-N	A
Copper	ug/L	1.5E+01	2.9E+01	3.6E+02		ug/L	9.6E+01	UCL-N	A	9.6E+01	UCL-N	A
Manganese	ug/L	1.4E+03	1.8E+03	6.6E+03		ug/L	1.9E+03	UCL-P	A	1.9E+03	UCL-P	A
Mercury (total)	ug/L	4.1E+00	6.6E+00	5.4E+01		ug/L	1.9E+01	UCL-N	A	1.9E+01	UCL-N	A
Methylmercury	ug/L	6.7E-03	9.6E-03	3.3E-02		ug/L	1.1E-02	UCL-P	A	1.1E-02	UCL-P	A
Nickel	ug/L	1.4E+01	1.9E+01	1.2E+02	*J*	ug/L	4.2E+01	UCL-N	A	4.2E+01	UCL-N	A
Thallium	ug/L	2.1E+00	2.7E+00	1.4E+01		ug/L	5.7E+00	UCL-N	A	5.7E+00	UCL-N	A
Vanadium	ug/L	1.9E+01	2.4E+01	6.3E+01		ug/L	4.7E+01	UCL-N	A	4.7E+01	UCL-N	A
2-Methylnaphthalene	ug/L	1.9E+01	4.6E+01	1.0E+00		ug/L	1.0E+00	Max	B	1.0E+00	Max	B
4-Methylphenol	ug/L	9.2E+00	1.7E+01	6.2E+01		ug/L	2.8E+01	UCL-N	A	2.8E+01	UCL-N	A
Naphthalene	ug/L	1.3E+01	2.6E+01	1.0E+02		ug/L	4.4E+01	UCL-N	A	4.4E+01	UCL-N	A
Benzene	ug/L	9.3E+00	1.8E+01	1.4E+02		ug/L	6.0E+01	UCL-N	A	6.0E+01	UCL-N	A
Chlorobenzene	ug/L	5.0E+00	6.9E+00	2.8E+01		ug/L	9.8E+00	UCL-N	A	9.8E+00	UCL-N	A
Chloroethane	ug/L	6.3E+00	8.5E+00	2.0E+01	*J*	ug/L	8.7E+00	UCL-N	A	8.7E+00	UCL-N	A
Toluene	ug/L	7.9E+01	1.9E+02	1.7E+03		ug/L	7.1E+02	UCL-N	A	7.1E+02	UCL-N	A
Xylene isomers	ug/L	2.1E+01	4.5E+01	3.9E+02		ug/L	1.6E+02	UCL-N	A	1.6E+02	UCL-N	A
1,4-Dichlorobenzene	ug/L	2.0E+01	4.7E+01	4.0E+00		ug/L	4.0E+00	Max	B	4.0E+00	Max	B
1,2-Dichloroethene isomers	ug/L	8.1E+00	1.4E+01	4.5E+01		ug/L	2.3E+01	UCL-N	A	2.3E+01	UCL-N	A

Notes: EPC - exposure point concentration
UCL - upper confidence limit
Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).

B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.

C - Mean detected concentration used for EPC in lead model (see text).

Table 3.7
Medium-specific exposure point concentration summary
Ventron/Velsicol Site OU1

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Air
Exposure Point:	Outdoor air

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Chromium	ug/m^3	NA	NA	NA		ug/m^3	2.1E-03	CALC	D	2.1E-03	CALC	D
Mercury vapor	ug/m^3	1.2E-02	2.3E-02	6.1E-02		ug/m^3	2.3E-02	UCL-P	A	2.3E-02	UCL-P	A

Notes: EPC - exposure point concentration
UCL - upper confidence limit
Duplicate sample results were averaged in calculations.
Arithmetic mean was calculated using half the detection limit for undetected results.
Statistical assessment of data was conducted using ProUCL 3.0.
UCL of data was calculated using half the detection limit for undetected analytes. UCL was not calculated for less than 10 data points.

Max - Maximum detected concentration

UCL-N - Non-parametric UCL

UCL-P - Parametric UCL

A - Medium EPC value per ProUCL 3.0 recommendation (see Appendix E).
B - UCL exceeds maximum detected concentration. Therefore, maximum detected concentration used for EPC.
C - Mean detected concentration used for EPC in lead model (see text).
D - Calculated through application of the EPA 2004a particulate emissions factor and EPA 2004b toxicity values for particulate chromium. UCL for surface soil data in the undeveloped area (See text).

Table 3.8
Medium-specific exposure point summary
Ventron/Velsicol Site

Scenario Timeframe:	Current/Future
Medium:	Subsurface Soil
Exposure Medium:	Air
Exposure Point:	Developed Area Indoor Air derived from subsurface soil

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Equilibrium Concentration (1)	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	ug/m^3	1.3E+01	NA	NA		ug/m^3	1.3E+01	NA	(1)	1.3E+01	NA	(1)

Note: EPC - exposure point concentration
NA - not applicable
UCL - upper confidence limit

(1) Equilibrium concentration estimated using the site UCL concentration through application of the Johnson and Ettinger Model. See text.

Table 3.9
Medium-specific exposure point summary
Ventron/Velsicol Site

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Exposure Point:	Developed Area Indoor Air derived from groundwater

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Equilibrium Concentration (1)	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	ug/m^3	6.1E-01	NA	NA		ug/m^3	6.1E-01	NA	(1)	6.1E-01	NA	(1)
Chlorobenzene	ug/m^3	5.6E-02	NA	NA		ug/m^3	5.6E-02	NA	(1)	5.6E-02	NA	(1)
Chloroethane	ug/m^3	4.6E-01	NA	NA		ug/m^3	4.6E-01	NA	(1)	4.6E-01	NA	(1)
1,4-Dichlorobenzene	ug/m^3	1.4E-02	NA	NA		ug/m^3	1.4E-02	NA	(1)	1.4E-02	NA	(1)
1,2-Dichloroethene, isomers	ug/m^3	2.6E-01	NA	NA		ug/m^3	2.6E-01	NA	(1)	2.6E-01	NA	(1)
Toluene	ug/m^3	7.6E+00	NA	NA		ug/m^3	7.6E+00	NA	(1)	7.6E+00	NA	(1)
Xylenes	ug/m^3	1.5E+00	NA	NA		ug/m^3	1.5E+00	NA	(1)	1.5E+00	NA	(1)
Naphthalene	ug/m^3	6.5E-02	NA	NA		ug/m^3	6.5E-02	NA	(1)	6.5E-02	NA	(1)

Note: EPC - exposure point concentration
NA - not applicable
UCL - upper confidence limit

(1) Equilibrium concentration estimated using the sitewide groundwater UCL concentration through application of the Johnson and Ettinger Model. See text.

Table 3.10
Medium-specific exposure point summary
Ventron/Velsicol Site

Scenario Timeframe:	Future
Medium:	Subsurface Soil
Exposure Medium:	Air
Exposure Point:	Undeveloped Area Indoor Air derived from subsurface soil

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Equilibrium Concentration (1)	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Carbazole	ug/m^3	6.6E-05	NA	NA		ug/m^3	6.6E-05	NA	(1)	6.6E-05	NA	(1)
Dibenzofuran	ug/m^3	3.1E-07	NA	NA		ug/m^3	3.1E-07	NA	(1)	3.1E-07	NA	(1)
Toluene	ug/m^3	6.8E+01	NA	NA		ug/m^3	6.8E+01	NA	(1)	6.8E+01	NA	(1)
Xylenes	ug/m^3	1.1E+02	NA	NA		ug/m^3	1.1E+02	NA	(1)	1.1E+02	NA	(1)
Benz[a]anthracene	ug/m^3	2.3E-03	NA	NA		ug/m^3	2.3E-03	NA	(1)	2.3E-03	NA	(1)
Benzo[a]pyrene	ug/m^3	2.3E-03	NA	NA		ug/m^3	2.3E-03	NA	(1)	2.3E-03	NA	(1)
Benzo[b]fluoranthene	ug/m^3	2.3E-03	NA	NA		ug/m^3	2.3E-03	NA	(1)	2.3E-03	NA	(1)
Benzo[ghi]perylene	ug/m^3	1.8E-03	NA	NA		ug/m^3	1.8E-03	NA	(1)	1.8E-03	NA	(1)
Benzo[k]fluoranthene	ug/m^3	1.6E-03	NA	NA		ug/m^3	1.6E-03	NA	(1)	1.6E-03	NA	(1)
Dibenz[a,h]anthracene	ug/m^3	1.6E-04	NA	NA		ug/m^3	1.6E-04	NA	(1)	1.6E-04	NA	(1)
Indeno[1,2,3-cd]pyrene	ug/m^3	1.9E-03	NA	NA		ug/m^3	1.9E-03	NA	(1)	1.9E-03	NA	(1)
Naphthalene	ug/m^3	2.1E+01	NA	NA		ug/m^3	2.1E+01	NA	(1)	2.1E+01	NA	(1)

Note: EPC - exposure point concentration
NA - not applicable
UCL - upper confidence limit

(1) Equilibrium concentration estimated using the site UCL concentration through application of the Johnson and Ettinger Model. See text.

Table 3.11
Medium-specific exposure point summary
Ventron/Velsicol Site

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Exposure Point:	Undeveloped Area Indoor Air derived from groundwater

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Equilibrium Concentration (1)	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	ug/m^3	1.0E+00	NA	NA		ug/m^3	1.0E+00	NA	(1)	1.0E+00	NA	(1)
Chlorobenzene	ug/m^3	9.4E-02	NA	NA		ug/m^3	9.4E-02	NA	(1)	9.4E-02	NA	(1)
Chloroethane	ug/m^3	7.5E-01	NA	NA		ug/m^3	7.5E-01	NA	(1)	7.5E-01	NA	(1)
1,4-Dichlorobenzene	ug/m^3	2.4E-02	NA	NA		ug/m^3	2.4E-02	NA	(1)	2.4E-02	NA	(1)
1,2-Dichloroethene, isomers	ug/m^3	4.3E-01	NA	NA		ug/m^3	4.3E-01	NA	(1)	4.3E-01	NA	(1)
Toluene	ug/m^3	1.3E+01	NA	NA		ug/m^3	1.3E+01	NA	(1)	1.3E+01	NA	(1)
Xylenes	ug/m^3	2.5E+00	NA	NA		ug/m^3	2.5E+00	NA	(1)	2.5E+00	NA	(1)
Naphthalene	ug/m^3	1.1E-01	NA	NA		ug/m^3	1.1E-01	NA	(1)	1.1E-01	NA	(1)

Note: EPC - exposure point concentration
NA - not applicable
UCL - upper confidence limit

(1) Equilibrium concentration estimated using the sitewide groundwater UCL concentration through application of the Johnson and Ettinger Model. See text.

Table 3.12
Medium-specific exposure point summary
Ventron/Velsicol Site

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Exposure Point:	Indoor Air from Showering/bathing - adult exposure

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Equilibrium Concentration (1)	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	ug/m^3	1.8E+03	NA	NA		ug/m^3	1.8E+03	NA	(1)	7.5E+01	NA	(1)
Chlorobenzene	ug/m^3	2.9E+02	NA	NA		ug/m^3	2.9E+02	NA	(1)	1.2E+01	NA	(1)
Chloroethane	ug/m^3	2.6E+02	NA	NA		ug/m^3	2.6E+02	NA	(1)	1.1E+01	NA	(1)
1,4-Dichlorobenzene	ug/m^3	1.2E+02	NA	NA		ug/m^3	1.2E+02	NA	(1)	5.0E+00	NA	(1)
1,2-Dichloroethene, isomers	ug/m^3	6.7E+02	NA	NA		ug/m^3	6.7E+02	NA	(1)	2.8E+01	NA	(1)
4-Methylphenol	ug/m^3	8.3E+02	NA	NA		ug/m^3	8.3E+02	NA	(1)	3.5E+01	NA	(1)
Toluene	ug/m^3	2.1E+04	NA	NA		ug/m^3	2.1E+04	NA	(1)	8.9E+02	NA	(1)
Xylenes	ug/m^3	4.8E+03	NA	NA		ug/m^3	4.8E+03	NA	(1)	2.1E+02	NA	(1)
Naphthalene	ug/m^3	1.3E+03	NA	NA		ug/m^3	1.3E+03	NA	(1)	5.5E+01	NA	(1)

Note: EPC - exposure point concentration
NA - not applicable
UCL - upper confidence limit

(1) Equilibrium concentration estimated using the sitewide groundwater UCL concentration through application of the Andelman Model. See text.

Table 3.13
Medium-specific exposure point summary
Ventron/Velsicol Site

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Air
Exposure Point:	Indoor Air from Showering/bathing - child exposure

							Reasonable Maximum Exposure			Central Tendency		
Chemical of Potential Concern	Units	Equilibrium Concentration (1)	95% UCL of Normal Data	Maximum detected value	Maximum Qualifier	EPC Units	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzene	ug/m^3	3.1E+03	NA	NA		ug/m^3	3.1E+03	NA	(1)	1.0E+02	NA	(1)
Chlorobenzene	ug/m^3	5.1E+02	NA	NA		ug/m^3	5.1E+02	NA	(1)	1.7E+01	NA	(1)
Chloroethane	ug/m^3	4.6E+02	NA	NA		ug/m^3	4.6E+02	NA	(1)	1.5E+01	NA	(1)
1,4-Dichlorobenzene	ug/m^3	2.1E+02	NA	NA		ug/m^3	2.1E+02	NA	(1)	6.9E+00	NA	(1)
1,2-Dichloroethene, isomers	ug/m^3	1.2E+03	NA	NA		ug/m^3	1.2E+03	NA	(1)	3.9E+01	NA	(1)
4-Methylphenol	ug/m^3	1.5E+03	NA	NA		ug/m^3	1.5E+03	NA	(1)	4.9E+01	NA	(1)
Toluene	ug/m^3	3.7E+04	NA	NA		ug/m^3	3.7E+04	NA	(1)	1.2E+03	NA	(1)
Xylenes	ug/m^3	8.6E+03	NA	NA		ug/m^3	8.6E+03	NA	(1)	2.8E+02	NA	(1)
Naphthalene	ug/m^3	2.3E+03	NA	NA		ug/m^3	2.3E+03	NA	(1)	7.6E+01	NA	(1)

Note: EPC - exposure point concentration
NA - not applicable
UCL - upper confidence limit

(1) Equilibrium concentration estimated using the sitewide groundwater UCL concentration through application of the Andelman Model. See text.

Table 4.1
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Soil/sediment
Exposure Medium: Surface soil/sediment
Exposure Point: Undeveloped Area surface soil/sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in sediment/soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x IR x FI x EF x ED / (BW x AT)
	IR	Ingestion rate	mg soil/day	100	U.S. EPA 1991	50	U.S. EPA 1997a	
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	30	U.S. EPA 1991	9	U.S. EPA 1991	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CS	Chemical concentration in sediment/soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x SA x AF x EF x ED x ABS
	SA	Skin surface area available for contact	cm^2/event	5,700	U.S. EPA 2004	5,700	U.S. EPA 2004	/ (BW x AT)
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.3	U.S. EPA 2005c	0.01	U.S. EPA 2004	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	30	U.S. EPA 1991	9	U.S. EPA 1991	
	BW	Body weight	kg	70	U.S. EPA 1997a	70	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA 1989	3,285	U.S. EPA 1989	
	ABS	Dermal absorption factor - chemical specific						
		Dermal absorption factor - arsenic	unitless	0.03	U.S. EPA 2004	0.03	U.S. EPA 2004	
		Dermal absorption factor - cadmium	unitless	0.001	U.S. EPA 2004	0.001	U.S. EPA 2004	
		Dermal absorption factor - semivolatile organics	unitless	0.10	U.S. EPA 2004	0.10	U.S. EPA 2004	
		Dermal absorption factor - PAHs	unitless	0.13	U.S. EPA 2004	0.13	U.S. EPA 2004	
		Dermal absorption factor - PCBs	unitless	0.14	U.S. EPA 2004	0.14	U.S. EPA 2004	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
PCB - polychlorinated biphenyl
PAH - polycyclic aromatic hydrocarbons
RME - reasonable maximum exposure

[a] Based on best professional judgment.

Table 4.2
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Soil/sediment
Exposure Medium: Surface soil/sediment
Exposure Point: Undeveloped Area surface soil/sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in sediment/soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x IR x FI x EF x ED / (BW x AT)
	IR	Ingestion rate	mg soil/day	100	U.S. EPA 1991	50	U.S. EPA 1997a	
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	9	[a]	9	[a]	
	BW	Body weight	kg	49	U.S. EPA 1997a	49	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	3,285	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CS	Chemical concentration in sediment/soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x SA x AF x EF x ED x ABS
	SA	Skin surface area available for contact	cm^2/event	4,000	NJDEP 2001	4,000	NJDEP 2001	/ (BW x AT)
	AF	Sediment/soil-to-skin adherence factor	mg/cm^2	0.3	U.S. EPA 2005c	0.04	U.S. EPA 2004	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	9	[a]	9	[a]	
	BW	Body weight	kg	49	U.S. EPA 1997a	49	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	3,285	U.S. EPA 1989	3,285	U.S. EPA 1989	
	ABS	Dermal absorption factor - chemical specific						
		Dermal absorption factor - arsenic	unitless	0.03	U.S. EPA 2004	0.03	U.S. EPA 2004	
		Dermal absorption factor - cadmium	unitless	0.001	U.S. EPA 2004	0.001	U.S. EPA 2004	
		Dermal absorption factor - semivolatile organics	unitless	0.10	U.S. EPA 2004	0.10	U.S. EPA 2004	
		Dermal absorption factor - PAHs	unitless	0.13	U.S. EPA 2004	0.13	U.S. EPA 2004	
		Dermal absorption factor - PCBs	unitless	0.14	U.S. EPA 2004	0.14	U.S. EPA 2004	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
PCB - polychlorinated biphenyl
PAH - polycyclic aromatic hydrocarbons
RME - reasonable maximum exposure

[a] Based on best professional judgment.

Table 4.3
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Developed/Undeveloped Area surface soil
Receptor Population: Long-Term Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration in soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x IR x FI x EF x ED / (BW x AT)
	IR	Ingestion rate	mg soil/day	50	U.S. EPA 1991	50	U.S. EPA 1997a	
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	250	U.S. EPA 2004	219	U.S. EPA 2004[a]	
	ED	Exposure duration	years	25	U.S. EPA 2004	9	U.S. EPA 2004[a]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x SA x AF x EF x ED x ABS
	SA	Skin surface area available for contact	cm^2/event	3,300	U.S. EPA 2004	3,300	U.S. EPA 2004	/ (BW x AT)
	AF	Soil-to-skin adherence factor	mg/cm^2	0.2	U.S. EPA 2004	0.02	U.S. EPA 2004	
	EF	Exposure frequency	days/year	250	U.S. EPA 2004	219	U.S. EPA 2004[a]	
	ED	Exposure duration	years	25	U.S. EPA 2004	9	U.S. EPA 2004[a]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA 1989	3,285	U.S. EPA 1989	
	ABS	Dermal absorption factor - chemical specific						
		Dermal absorption factor - arsenic	unitless	0.03	U.S. EPA 2004	0.03	U.S. EPA 2004	
		Dermal absorption factor - cadmium	unitless	0.001	U.S. EPA 2004	0.001	U.S. EPA 2004	
		Dermal absorption factor - semivolatile organics	unitless	0.10	U.S. EPA 2004	0.10	U.S. EPA 2004	
		Dermal absorption factor - PAHs	unitless	0.13	U.S. EPA 2004	0.13	U.S. EPA 2004	
		Dermal absorption factor - PCBs	unitless	0.14	U.S. EPA 2004	0.14	U.S. EPA 2004	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
PCB - polychlorinated biphenyl
PAH - polycyclic aromatic hydrocarbons
RME - reasonable maximum exposure

[a] Values modified based on EPA 2004 from 250 days per year for 6.6 years, overall effect is slight increase in exposure estimate for carcinogenic CoPCs and slight reduction for noncancer estimates.

Table 4.4
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface soil
Exposure Point: Developed and undeveloped areas subsurface soil (1-20 ft depths)
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical concentration - subsurface soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x IR x FI x EF x ED / (BW x AT)
	IR	Ingestion rate	mg soil/day	330	NJDEP 2003	50	U.S. EPA 1997a	
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	60	NJDEP 2001	25	NJDEP 2001	
	ED	Exposure duration	years	2	NJDEP 2001	2	NJDEP 2001	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	730	U.S. EPA 1989	730	U.S. EPA 1989	
Dermal	CS	Chemical concentration in soil	mg/kg	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	kg/mg	0.000001	--	0.000001	--	CS x CF x SA x AF x EF x ED x ABS
	SA	Skin surface area available for contact	cm^2/event	3,300	U.S. EPA 2004	3,300	U.S. EPA 2004	/ (BW x AT)
	AF	Soil-to-skin adherence factor	mg/cm^2	0.2	U.S. EPA 2004	0.1	NJDEP 2001	
	EF	Exposure frequency	days/year	60	NJDEP 2001	25	NJDEP 2001	
	ED	Exposure duration	years	2	NJDEP 2001	2	NJDEP 2001	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	730	U.S. EPA 1989	730	U.S. EPA 1989	
	ABS	Dermal absorption factor - chemical specific						
		Dermal absorption factor - arsenic	unitless	0.03	U.S. EPA 2004	0.03	U.S. EPA 2004	
		Dermal absorption factor - cadmium	unitless	0.001	U.S. EPA 2004	0.001	U.S. EPA 2004	
		Dermal absorption factor - semivolatile organics	unitless	0.10	U.S. EPA 2004	0.10	U.S. EPA 2004	
		Dermal absorption factor - PAHs	unitless	0.13	U.S. EPA 2004	0.13	U.S. EPA 2004	
		Dermal absorption factor - PCBs	unitless	0.14	U.S. EPA 2004	0.14	U.S. EPA 2004	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
PCB - polychlorinated biphenyl
PAH - polycyclic aromatic hydrocarbon
RME - reasonable maximum exposure

Table 4.5
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Surface water
Exposure Medium: Surface water
Exposure Point: Undeveloped Area surface water
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical concentration in surface water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	L/m^3	0.001	U.S. EPA 1989	0.001	U.S. EPA 1989	CW x CF x IR x EF x ED x ET / (BW x AT)
	IR	Ingestion rate	mL/hour	12	U.S. EPA 1989[a]	12	U.S. EPA 1989[a]	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	30	U.S. EPA 1991	9	U.S. EPA 1991	
	ET	Exposure time	hours/event	1	[a]	0.5	[a]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CW	Chemical concentration in surface water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	L/m^3	0.001	--	0.001	--	CW x CF x SA x PC x EF x ED x ET
	SA	Skin surface area available for contact	cm^2 /event	5,700	U.S. EPA 2004	5,700	U.S. EPA 2004	/ (BW x AT)
	PC	Chem.-spec. dermal permeability constant	cm/hour	chem. spec.	NJDEP 2001; U.S. EPA 2004	chem. spec.	NJDEP 2001; U.S. EPA 2004	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	30	U.S. EPA 1991	9	U.S. EPA 1991	
	ET	Exposure time	hrs/day	1	[a]	0.5	[a]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA 1989	3,285	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
RME - reasonable maximum exposure

[a] Based on best professional judgment.

Table 4.6
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Surface water
Exposure Medium: Surface water
Exposure Point: Undeveloped Area surface water
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical concentration in surface water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	L/m^3	0.001	U.S. EPA 1989	0.001	U.S. EPA 1989	CW x CF x IR x EF x ED x ET / (BW x AT)
	IR	Ingestion rate	mL/hour	12	U.S. EPA 1989[a]	12	U.S. EPA 1989[a]	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	9	[a]	9	[a]	
	ET	Exposure time	hours/event	1	[a]	0.5	[a]	
	BW	Body weight	kg	49	U.S. EPA 1997a	49	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	3,285	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CW	Chemical concentration in surface water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	L/m^3	0.001	U.S. EPA 1989	0.001	U.S. EPA 1989	CW x CF x SA x PC x EF x ED x ET
	SA	Skin surface area available for contact	cm^2 /event	4,000	NJDEP 2001	4,000	NJDEP 2001	/ (BW x AT)
	PC	Chem.-spec. dermal permeability constant	cm/hour	chem. spec.	NJDEP 2001; U.S. EPA 2004	chem. spec.	NJDEP 2001; U.S. EPA 2004	
	EF	Exposure frequency	days/year	132	NJDEP 2001	65	NJDEP 2001	
	ED	Exposure duration	years	9	[a]	9	[a]	
	ET	Exposure time	hours/day	1	[a]	0.5	[a]	
	BW	Body weight	kg	49	U.S. EPA 1997a	49	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	3,285	U.S. EPA 1989	3,285	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
PCB - polychlorinated biphenyl
RME - reasonable maximum exposure

[a] Based on best professional judgment. Refer to supporting information in text.

Table 4.7 Summary of factors used to assess dermal exposure contaminants in water

Chemical of Concern	Dermal Permeability Constants[a] (cm/hour)
Inorganics	
Arsenic	0.001
Barium	0.001
Cadmium	
Water	0.001
Chromium (as chromium(VI))	0.002
Iron	0.001
Manganese	0.001
Mercury	0.001
Methylmercury	0.001
Nickel	0.0001[b]
Thallium (as thallium chloride)	0.001
Vanadium	0.001
Organics	
Benzene	0.021[b]
Chloroethane	0.008[b]
Chlorobenzene	0.041[b]
1,4-Dichlorobenzene	0.062[b]
1,2-Dichloroethene, isomers	0.0013[b]
Ethylbenzene	0.049
4-Methylphenol (as phenol)	0.0043
Toluene	0.045[b]
Xylene isomers (total)	0.08[b]
PAHs	
2-Methylnaphthalene (as napthalene)	0.069[b]
Napthalene	0.069[b]

Note: -- - no data available for these chemicals

[a] Dermal absorption factors, oral to dermal adjustment factors, and permeability constants from U.S. EPA (2004) unless otherwise noted.

[b] Dermal permeability factor provided by NJDEP and EPA (NJDEP 2001).

Table 4.8
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical concentration in water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion rate	L/day	1	U.S. EPA 1997a	0.7	U.S. EPA 1997a	CW x IR x FI x EF x ED / (BW x AT)
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	250	U.S. EPA 2004	219	U.S. EPA 2004[b]	
	ED	Exposure duration	years	25	U.S. EPA 2004	9	U.S. EPA 2004[b]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CW	Chemical concentration in water	mg/L	Table 3 series	--	Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	SA	Skin surface area available for contact	cm^2/event	793	U.S. EPA 1997a	793	U.S. EPA 1997a	CW x CF x SA x PC x EF x ED x ET
	PC	Chem.-spec. dermal permeability constant	cm/hour	chem. spec.	NJDEP 2001; U.S. EPA 2004	chem. spec.	NJDEP 2001; U.S. EPA 2004	/ (BW x AT)
	CF	Volumetric conversion factor l liter /1000 cm^2	--	0.001	U.S. EPA 1989	0.001	U.S. EPA 2004	
	EF	Exposure frequency	days/year	250	U.S. EPA 2004	219	U.S. EPA 2004[b]	
	ED	Exposure duration	years	25	U.S. EPA 2004	9	U.S. EPA 2004[b]	
	ET	Exposure time	hours/day	0.03	[a]	0.03	[a]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA 1989	3,285	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
RME - reasonable maximum exposure

Dermal surface areas represent values for hands only and were derived from the average of values for men and women. RME values are maximum, and central tendency values for hand surface areas are means, from U.S. EPA (1997a, Table 6-4).

Exposure time relates to washing hands. CT value for ingestion rate is mean of 1.4 L from U.S. EPA (1997a) assuming half is consumed at work.

[a] Based on best professional judgment. Based on best professional judgment. Because hand washing involves a very brief exposure period, a fractional intake for dermal exposure to water of 0.03 was applied to represent about 2 minutes of exposure per day, (i.e., 30 seconds per exposure and four exposures per day).

[b] Values modified based on EPA 2004 from 250 days per year for 6.6 years, overall effect is slight increase in exposure estimate for carcinogenic CoPCs and slight reduction for noncancer estimates.

Table 4.9
Values used for daily intake calculations
Ventron Velsicol Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater sitewide
Receptor Population: Future Hypothetical Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical concentration in water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion rate	L/day	2	U.S. EPA 1991	1.4	U.S. EPA 1997a	CW x IR x FI x EF x ED / (BW x AT)
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	350	U.S. EPA 1991	350	U.S. EPA 1991	
	ED	Exposure duration	years	30	U.S. EPA 1991	9	U.S. EPA 1991	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA 1989	3,285	U.S. EPA 1989	
Dermal	CW	Chemical concentration in water	mg/L	Table 3 series	--	Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	SA	Skin surface area available for contact	cm^2/event	18,000	U.S. EPA 2004	18,000	U.S. EPA 2004	CW x CF x SA x PC x EF x ED x ET x EV
	PC	Chem.-spec. dermal permeability constant	cm/hour	chem. spec.	NJDEP 2001; U.S. EPA 2004	chem. spec.	NJDEP 2001; U.S. EPA 2004	/ (BW x AT)
	CF	Volumetric conversion factor l liter /1000 cm^2	--	0.001	U.S. EPA 1989	0.001	U.S. EPA 2004	
	EF	Exposure frequency	days/year	350	U.S. EPA 2004	350	U.S. EPA 2004	
	ED	Exposure duration	years	30	U.S. EPA 2004	9	U.S. EPA 2004	
	ET	Exposure time	hours/day	0.58	U.S. EPA 2004[b]	0.25	U.S. EPA 2004[b]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	10,950	U.S. EPA 1989	3,285	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
RME - reasonable maximum exposure

Central tendency ingestion rate is a mean from U.S. EPA (1997c, Table 3-30).

[a] Based on best professional judgment.
[b] Modified based on 2004 - results in a higher exposure estimate.

Table 4.10
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater sitewide
Receptor Population: Future Hypothetical Resident
Receptor Age: Young Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical concentration in water	mg/L	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion rate	L/day	1.5	U.S. EPA 1997a	0.74	U.S. EPA 1997a	CW x IR x FI x EF x ED / (BW x AT)
	FI	Fraction ingested	--	1	[a]	1	[a]	
	EF	Exposure frequency	days/year	350	U.S. EPA 1991	350	U.S. EPA 1991	
	ED	Exposure duration	years	6	U.S. EPA 1991	6	U.S. EPA 1991	
	BW	Body weight	kg	15	U.S. EPA 1997a	15	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA 1989	2,190	U.S. EPA 1989	
Dermal	CW	Chemical concentration in water	mg/L	Table 3 series	--	Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	SA	Skin surface area available for contact	cm^2/event	6,600	U.S. EPA 2004	6,600	U.S. EPA 2004	CW x CF x SA x PC x EF x ED x ET
	PC	Chem.-spec. dermal permeability constant	cm/hour	chem. spec.	NJDEP 2001; U.S. EPA 2004	chem. spec.	NJDEP 2001; U.S. EPA 2004	/ (BW x AT)
	CF	Volumetric conversion factor l liter /1000 cm^2	--	0.001	U.S. EPA 1989	0.001	U.S. EPA 2004	
	EF	Exposure frequency	days/year	350	U.S. EPA 2004	350	U.S. EPA 2004	
	ED	Exposure duration	years	6	U.S. EPA 2004	6	U.S. EPA 2004	
	ET	Exposure time	hours/day	1.0	U.S. EPA 2004[b]	0.33	U.S. EPA 2004[b]	
	BW	Body weight	kg	15	U.S. EPA 1997a	15	U.S. EPA 1997a	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	2,190	U.S. EPA 1989	2,190	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
RME - reasonable maximum exposure

Central tendency ingestion rate is a mean from U.S. EPA (1997, Table 3-30) and represents the average of mean intakes of children less than 3 years and children 3 to 5 years.

[a] Based on best professional judgment.
[b] Modified based on 2004 - results in a higher exposure estimate.

Table 4.11
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Outdoor air
Receptor Population: Long-term Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m^3	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	--	1	--	1	--	CA x CF x IR x EF x ED / (BW x AT)
	IR	Inhalation rate	m^3/day	6.6[a]	U.S. EPA 1997a	2.6[b]	U.S. EPA 1997a	
	EF	Exposure frequency	days/year	250	U.S. EPA 2004	219	U.S. EPA 2004[c]	
	ED	Exposure duration	years	25	U.S. EPA 2004	9	U.S. EPA 2004[c]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA 1989	3,285	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
RME - reasonable maximum exposure

[a] Represents two hours of outdoor work at the upper percentile inhalation rate of 3.3 m^3/hour.

[b] Represents two hours of outdoor work at the average inhalation rate of 1.3 m^3/hour.

[c] Values modified based on EPA 2004 from 250 days per year for 6.6 years, overall effect is slight increase in exposure estimate for carcinogenic CoPCs and slight reduction for noncancer estimates.

Table 4.12
Values used for daily intake calculations
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Medium: Groundwater and subsurface soil
Exposure Medium: Air
Exposure Point: Indoor air via vapor intrusion
Receptor Population: Long-Term Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical concentration in air	mg/m^3	see Table 3 series	--	see Table 3 series	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CF	Conversion factor	--	1	--	1	--	CA x CF x IR x EF x ED / (BW x AT)
	IR	Inhalation rate[a]	m^3/day	20	U.S. EPA 2005c	9	U.S. EPA 1997a	
	EF	Exposure frequency	days/year	250	U.S. EPA 2004	219	U.S. EPA 2004[b]	
	ED	Exposure duration	years	25	U.S. EPA 2004	9	U.S. EPA 2004[b]	
	BW	Body weight	kg	70	U.S. EPA 2004	70	U.S. EPA 2004	
	AT-C	Averaging Time (Cancer)	days	25,550	U.S. EPA 1989	25,550	U.S. EPA 1989	
	AT-NC	Averaging Time (Noncancer)	days	9,125	U.S. EPA 1989	3,285	U.S. EPA 1989	

Note: -- - not applicable
CT - central tendency
OU1 - Operable Unit 1
RME - reasonable maximum exposure

[a] The inhalation rate for CT was calculated using a rate of 1.0 m^3/hour for 9 hours and the RME estimate is as requeste by EPA based on 8 hour day at 2.5 m3/day.
This value is presented in Exhibit 4-1 of the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*

[b] Values modified based on EPA 2004 from 250 days per year for 6.6 years, overall effect is slight increase in exposure estimate for carcinogenic CoPCs and slight reduction for noncancer estimates.

Table 5.1
Noncancer toxicity data -- oral/dermal
Ventron/Velsicol Site

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor[a]	Adjusted Dermal RfD[b]	Units	Primary Target Organ or System	Combined Uncertainty/ Modifying Factors	Sources of RfD	Dates of RfD: Target Organ[c], (MM/DD/YY)
Inorganic Analytes										
Antimony	Chronic	0.0004	mg/kg-day	0.15	0.00006	mg/kg-day	Longevity; metabolic	1000/1	IRIS	2/15/05
Arsenic	Chronic	0.0003	mg/kg-day	0.95	0.0003	mg/kg-day	Skin/vascular	3/1	IRIS	2/15/05
Barium	Chronic	0.07	mg/kg-day	0.07	0.0049	mg/kg-day	None reported (kidney)	3/1	IRIS	2/15/05
Cadmium (water)[d]	Chronic	0.0005	mg/kg-day	0.025	0.000013	mg/kg-day	Kidney	10/1	IRIS	2/15/05
Cadmium (food, soil, sediment)[d]	Chronic	0.001	mg/kg-day	0.05	0.00005	mg/kg-day	Kidney	10/1	IRIS	2/15/05
Chromium (as chromium (VI))[e]	Chronic	0.003	mg/kg-day	0.025	0.000075	mg/kg-day	None reported	300/3	IRIS	2/15/05
Copper	Chronic	0.04	mg/kg-day	--	0.04	mg/kg-day	--	--	HEAST[f]	NA
Lead	Chronic	NA	mg/kg-day	NA	NA	mg/kg-day	NA	NA	NA	NA
Manganese	Chronic	0.047	mg/kg-day	0.04	0.0019	mg/kg-day	Central nervous	1/3	IRIS	2/15/05
Mercury (as mercuric chloride)	Chronic	0.0003	mg/kg-day	0.07	0.000021	mg/kg-day	Immunologic	1,000/1	IRIS	2/15/05
Methylmercury	Chronic	0.0001	mg/kg-day	0.95	0.0001	mg/kg-day	Neurologic	10/1	IRIS	2/15/05
Mercury vapor	--	--		--	--		--	--	--	--
Nickel (soluble salts)	Chronic	0.02	mg/kg-day	0.04	0.0008	mg/kg-day	Decreased body and organ weights	300/1	IRIS	2/15/05
Selenium	Chronic	0.005	mg/kg-day	0.8	0.005	mg/kg-day	Selenosis: liver, CNS, skin	3/1	IRIS	2/15/05
Silver	Chronic	0.005	mg/kg-day	0.04	0.0002	mg/kg-day	Skin (argyria)	3/1	IRIS	2/15/05
Thallium (as thallium chloride)	Chronic	0.00008	mg/kg-day	1	0.00008	mg/kg-day	Liver enzymes	3000/1	IRIS	2/15/05
Vanadium (as vanadium pentoxide)	Chronic	0.009	mg/kg-day	0.026	0.00023	mg/kg-day	Decreased hair cystine	100/1	IRIS	2/15/05
Zinc	Chronic	0.3	mg/kg-day	--	0.3	mg/kg-day	Blood	3/1	IRIS	2/15/05
Organic Analytes										
Benzene	Chronic	0.004	mg/kg-day	1	0.004	mg/kg-day	Hematopoietic	300/1	IRIS	2/15/05
bis[2-ethylhexyl]phthalate	Chronic	0.02	mg/kg-day	1	0.02	mg/kg-day	Increased liver weight	1000/1	IRIS	2/15/05
Carbazole	--	--		--	--		--	--	--	--
Chlorobenzene	Chronic	0.02	mg/kg-day	1	0.02	mg/kg-day	Liver	1000/1	IRIS	2/15/05
Chloroethane	Chronic	0.4	mg/kg-day	--	0.4	mg/kg-day	--	--	NCEA[f]	NA
Dibenzofuran	Chronic	0.002	mg/kg-day	1	0.002	mg/kg-day	--	--	NCEA[f]	NA
1,4-Dichlorobenzene	Chronic	0.03	mg/kg-day	1	0.03	mg/kg-day	--	--	NCEA[f]	NA
1,2-Dichloroethene, isomers (as trans 1,2-dichloroethylene)	Chronic	0.02	mg/kg-day	1	0.02	mg/kg-day	Serum enzymes	1000/1	IRIS	2/15/05

Table 5.1
Noncancer toxicity data -- oral/dermal
Ventron/Velsicol Site

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor[a]	Adjusted Dermal RfD[b] (mg/kg-day)	Units	Primary Target Organ or System	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ[c], (MM/DD/YY)
4-Methylphenol	Chronic	0.005	mg/kg-day	1	0.005	mg/kg-day	--	--	HEAST[f]	NA
Toluene	Chronic	0.2	mg/kg-day	1	0.2	mg/kg-day	Liver and kidney weight	1000/1	IRIS	2/15/05
Xylene isomers (total)	Chronic	0.2	mg/kg-day	1	0.2	mg/kg-day	Body weight, mortality	1000/1	IRIS	2/15/05
PAHs										
Benz[a]anthracene	--	--		--	--		--	--	--	--
Benzo[a]pyrene	--	--		--	--		--	--	--	--
Benzo[b]fluoranthene	--	--		--	--		--	--	--	--
Benzo[g,h,i]perylene (as naphthalene)[g]	--	0.02	mg/kg-day	1	0.02	mg/kg-day	--	--	--[g]	--
Benzo[k]fluoranthene	--	--		--	--		--	--	--	--
Dibenz[a,h]anthracene	--	--		--	--		--	--	--	--
Indeno[1,2,3-cd]pyrene	--	--		--	--		--	--	--	--
2-Methylnaphthalene	Chronic	0.004	mg/kg-day	1	0.004	mg/kg-day	Lung damage	1000/1	IRIS	2/15/05
Naphthalene	Chronic	0.02	mg/kg-day	1	0.02	mg/kg-day	Body weight	3000/1	IRIS	2/15/05
PCBs										
Aroclor® 1242 (as Aroclor® 1254)[h]	Chronic	0.00002	mg/kg-day	1	0.00002	mg/kg-day	Immunologic	300/1	IRIS	2/15/05
Aroclor® 1248 (as Aroclor® 1254)[h]	Chronic	0.00002	mg/kg-day	1	0.00002	mg/kg-day	Immunologic	300/1	IRIS	2/15/05
Aroclor® 1254	Chronic	0.00002	mg/kg-day	1	0.00002	mg/kg-day	Immunologic	300/1	IRIS	2/15/05
Aroclor® 1260 (as Aroclor® 1254)[h]	Chronic	0.00002	mg/kg-day	1	0.00002	mg/kg-day	Immunologic	300/1	IRIS	2/15/05

Note: Toxicity values obtained from U.S. EPA (2005b), unless otherwise specified.

-- - not available
EPA - U.S. Environmental Protection Agency
IRIS - Integrated Risk Information System
NA - not applicable
NCEA - National Center for Environmental Assessment
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PPRTV - provisional peer reviewed toxicity values from EPA
RfD - reference dose

[a] Dermal adjustment factors from Exhibit 4-1 in U.S. EPA (2004).

[b] Consistent with U.S. EPA (2004), where oral absorption is less than 50 percent, oral RfDs are adjusted by multiplying by the oral to dermal adjustment factor.

In addition, as recommended in EPA (2004) dermal risks for inorganics evaluated only where absorption information is available.

Table 5.1
Noncancer toxicity data -- oral/dermal
Ventron/Velsicol Site

[c] Date represents: IRIS - date is when IRIS was searched.

[d] RfDs are available for cadmium in food or water.

[e] Because the chemical forms of chromium present are not known, the human health risk assessment conservatively assumes that all chromium is present as chromium(VI).

[f] Source as cited by U.S. EPA Region IX (U.S. EPA 2005a).

[g] Toxicity data for naphthalene applied consistent with EPA guidance (U.S. EPA 2005, personal communication from Stan Barone to Michael Sivak).

[h] Toxicity data for Aroclor® applied consistent with guidance from EPA (U.S. EPA 2005, personal communication from Stan Barone to Michael Sivak).

Table 5.2
Noncancer toxicity data -- inhalation
Ventron/Velsicol Site

Chemical of Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfDi	Units	Primary Target Organ or System	Combined Uncertainty/ Modifying Factors	Sources of RfC:RfD	Dates of RfD[a], (MM/DD/YY)
Inorganic Analytes									
Antimony	--	--		--	--	--	--	--	--
Arsenic	--	--		--	--	--	--	--	--
Barium	--	--		--	--	--	--	--	--
Cadmium	--	--		--	--	--	--	--	--
Chromium (as chromium (VI), particulate)[b]	Chronic	0.0001	mg/m^3	0.000029	mg/kg-day	Lung effects	300/1	IRIS	2/15/05
Copper	--	--		--	--	--	--	--	--
Lead	--	--		--	--	--	--	--	--
Manganese	--	--		--	--	--	--	--	--
Mercury vapor	Chronic	0.0003	mg/m^3	0.000086	mg/kg-day	Central nervous system	30/1	IRIS	2/15/05
Nickel (soluble salts)	--	--		--	--	--	--	--	--
Selenium	--	--		--	--	--	--	--	--
Silver	--	--		--	--	--	--	--	--
Thallium	--	--		--	--	--	--	--	--
Vanadium	--	--		--	--	--	--	--	--
Zinc	--	--		--	--	--	--	--	--
Organic Analytes									
Benzene	Chronic	0.03	mg/m^3	0.0086	mg/kg-day	Hematopoietic	300/1	IRIS	2/15/05
bis[2-ethylhexyl]phthalate	--	--		--	--	--	--	--	--
Carbazole	--	--		--	--	--	--	--	--
Chlorobenzene	Chronic	0.06	mg/m^3	0.017	mg/kg-day	--	--	NCEA[c]	NA
Chloroethane	Chronic	10	mg/m^3	2.9	mg/kg-day	Delayed fetal ossification	300/1	IRIS	2/15/05
Dibenzofuran	Chronic	0.007	mg/m^3	0.002	mg/kg-day	--	--	r[c]	NA
1,4-Dichlorobenzene	Chronic	0.8	mg/m^3	0.23	mg/kg-day	Increased liver weights	100/1	IRIS	2/15/05
1,2-Dichloroethene, isomers (as trans 1,2-dichloroethylene)	Chronic	0.07	mg/m^3	0.020	mg/kg-day	--	--	r[c]	NA
4-Methylphenol	Chronic	0.018	mg/m^3	0.005	mg/kg-day	--	--	r[c]	NA
Toluene	Chronic	0.4	mg/m^3	0.11	mg/kg-day	Neurological effects	300/1	IRIS	2/15/05
Xylene isomers (total)	Chronic	0.1	mg/m^3	0.029	mg/kg-day	Central nervous system	300/1	IRIS	2/15/05
PAHs									
Benz[a]anthracene	--	--		--	--	--	--	--	--
Benzo[a]pyrene	--	--		--	--	--	--	--	--
Benzo[b]fluoranthene	--	--		--	--	--	--	--	--
Benzo[ghi]perylene	--	--		--	--	--	--	--	--
Benzo[k]fluoranthene	--	--		--	--	--	--	--	--

Table 5.2
Noncancer toxicity data -- inhalation
Ventron/Velsicol Site

Chemical of Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfDi	Units	Primary Target Organ or System	Combined Uncertainty/ Modifying Factors	Sources of RfC:RfD	Dates of RfD[a], (MM/DD/YY)
Dibenz[a,h]anthracene	--	--		--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	--	--		--	--	--	--	--	--
2-Methylnaphthalene	--	--		--	--	--	--	--	--
Naphthalene	Chronic	0.003	mg/m^3	0.00086	mg/kg-day	Nasal effects; hyperplasia	3000/1	IRIS	2/15/05
PCBs									
Aroclor® 1242	--	--		--	--	--	--	--	--
Aroclor® 1248	--	--		--	--	--	--	--	--
Aroclor® 1254	--	--		--	--	--	--	--	--
Aroclor® 1260	--	--		--	--	--	--	--	--

Toxicity values obtained from U.S. EPA (2005b), unless otherwise specified.

-- - not available
EPA - U.S. Environmental Protection Agency
IRIS - Integrated Risk Information System
NA - not applicable
NCEA - National Center for Environmental Assessment
PAH - polycyclic aromatic hydrocarbon
r - route extrapolation
RfC - reference concentration
RfD - reference dose

Adjustment factor applied to RfC to calculate RfD = 1/70 kg $\times$ 20 m^3/day. Adjustment factor applied to RfD to calculate RfC = 70 kg $\times$ 1/20 m^3/day.

[a] Date represents: IRIS - date is when IRIS was searched.

[b] Because the chemical forms of chromium present are not known, the human health risk assessment conservatively assumes that all chromium is present as chromium(VI)

[c] Source as cited by U.S. EPA Region IX (U.S. EPA 2005a).

Table 6.1
Cancer toxicity data -- oral/dermal
Ventron/Velsicol Site

Contaminant of Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor[a]	Adjusted Dermal Cancer Slope Factor[a]	Units	Weight-of-Evidence/ Cancer Guideline Description[b]	Source of CSF	Date of CSF Source[c] (MM/DD/YY)
Inorganic Analytes							
Antimony	NA	--	--		--	--	--
Arsenic	1.5	95%	1.5	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/15/05
Barium	NA	--	--		--	--	--
Cadmium	NA	--	--		--	--	--
Chromium (as chromium (VI))[d]	NA	--	--		--	--	--
Copper	NA	--	--		--	--	--
Lead	NA	--	--		--	--	--
Manganese	NA	--	--		--	--	--
Mercury (total)	NA	--	--		--	--	--
Methylmercury	NA	--	--		--	--	--
Mercury vapor	NA	--	--		--	--	--
Nickel	NA	--	--		--	--	--
Selenium	NA	--	--		--	--	--
Silver	NA	--	--		--	--	--
Thallium	NA	--	--		--	--	--
Vanadium	NA	--	--		--	--	--
Zinc	NA	--	--		--	--	--
Organic Analytes							
Benzene	0.055	100%	0.055	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/15/05
bis[2-ethylhexyl]phthalate	0.014	100%	0.014	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/15/05
Carbazole	0.02	100%	0.02	$(mg/kg\text{-}day)^{-1}$	B2	HEAST[e]	NA
Chlorobenzene	NA	--	--		--	--	--
Chloroethane	0.0029	90%	0.0029	$(mg/kg\text{-}day)^{-1}$	--	NCEA[e]	NA
Dibenzofuran	NA	--	--		--	--	--
1,4-Dichlorobenzene	0.024	100%	0.024	$(mg/kg\text{-}day)^{-1}$	C	HEAST[e]	NA
1,2-Dichloroethene, isomers	NA	--	--		--	--	--
4-Methylphenol	NA	--	--		--	--	--
Toluene	NA	--	--		--	--	--
Xylenes	NA	--	--		--	--	--
PAHs[f]	NA	--	--		--	--	--
Benz[a]anthracene	0.73	1	0.73	(mg/kg-day)–1	B2	IRIS	2/15/05
Benzo[a]pyrene	7.3	1	7.3	(mg/kg-day)–1	B2	IRIS	2/15/05

Table 6.1
Cancer toxicity data -- oral/dermal
Ventron/Velsicol Site

Contaminant of Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor[a]	Adjusted Dermal Cancer Slope Factor[a]	Units	Weight-of-Evidence/ Cancer Guideline Description[b]	Source of CSF	Date of CSF Source[c] (MM/DD/YY)
Benzo[b]fluoranthene	0.73	1	0.73	(mg/kg-day)–1	B2	IRIS	2/15/05
Benzo[ghi]perylene	NA	--	--		--	--	--
Benzo[k]fluoranthene	0.073	1	0.073	(mg/kg-day)–1	B2	IRIS	2/15/05
Dibenz[a,h]anthracene	7.3	1	7.3	(mg/kg-day)–1	B2	IRIS	2/15/05
Indeno[1,2,3-cd]pyrene	0.73	1	0.73	(mg/kg-day)–1	B2	IRIS	2/15/05
2-Methylnaphthalene	NA	--	--		--	--	--
Napthalene	NA	--	--		--	--	--
PCBs (sum of detected Aroclors®)	2.0	100%	2.0	$(mg/kg\text{-}day)^{-1}$	B2	IRIS[e]	NA

Note: Toxicity values obtained from U.S. EPA (2005b), unless otherwise specified.

CSF - carcinogenic slope factor
EPA - U.S. Environmental Protection Agency
HEAST - Health Effects Assessment Summary Tables
IRIS - Integrated Risk Information System
-- - not available
NA - not applicable
NCEA - National Center for Environmental Assessment
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl

[a] Consistent with U.S. EPA (2004), where oral absorption is less than 50 percent, oral reference doses are adjusted by multiplying by the oral to dermal adjustment factor. Dermal adjustment factors from Exhibit 4-1 of U.S. EPA (2004).

[b] EPA group:
A - human carcinogen
B2 - probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - possible human carcinogen.

[c] Date represents: IRIS - date is when IRIS was searched.

[d] Because the chemical forms of chromium present are not known, the human health risk assessment conservatively assumes that all chromium is present as chromium(VI).

[e] Carcinogenic slope factor as cited by U.S. EPA Region IX (U.S. EPA 2005a).

[f] Carcinogenic slope factors for PAH compounds are based on potency relative to benzo[a]pyrene as cited by U.S. EPA Region IX (U.S. EPA 2005a).

Table 6.2
Cancer toxicity data -- inhalation
Ventron/Velsicol Site

Contaminant of Concern	Unit Risk	Units	Adjustment[a]	Inhalation Cancer Slope Factor	Units	Weight-of-Evidence/ Cancer Guideline Description[b]	Source	Date [c] (MM/DD/YY)
Inorganic Analytes								
Antimony	NA		--	--		--	--	--
Arsenic	NA		--	--		--	--	--
Barium	NA		--	--		--	--	--
Cadmium	NA		--	--		--	--	--
Chromium (as chromium (VI), particulate)[d]	1.2E-02	$(\mu g/m^3)^{-1}$	3500	42	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/15/05
Copper	NA		--	--		--	--	--
Lead	NA		--	--		--	--	--
Manganese	NA		--	--		--	--	--
Mercury (total)	NA		--	--		--	--	--
Methylmercury	NA		--	--		--	--	--
Mercury vapor	NA		--	--		--	--	--
Nickel	NA		--	--		--	--	--
Selenium	NA		--	--		--	--	--
Silver	NA		--	--		--	--	--
Thallium	NA		--	--		--	--	--
Vanadium	NA		--	--		--	--	--
Zinc	NA		--	--		--	--	--
Organic Analytes								
Benzene	7.8E-06	$(\mu g/m^3)^{-1}$	3500	0.0273	$(mg/kg\text{-}day)^{-1}$	A	IRIS[e]	2/15/05
bis[2-Ethylhexyl]phthalate	NA		--	--		--	--	--
Carbazole	NA		--	--		--	--	--
Chlorobenzene	NA		--	--		--	--	--
Chloroethane	8.3E-07	$(\mu g/m^3)^{-1}$	3500	0.0029	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
Dibenzofuran	NA		--	--		--	--	--
1,4-Dichlorobenzene	6.3E-06	$(\mu g/m^3)^{-1}$	3500	0.022	$(mg/kg\text{-}day)^{-1}$	--	NCEA[e]	NA
1,2-Dichloroethene, isomers	NA		--	--		--	--	--

Table 6.2
Cancer toxicity data -- inhalation
Ventron/Velsicol Site

Contaminant of Concern	Unit Risk	Units	Adjustment[a]	Inhalation Cancer Slope Factor	Units	Weight-of-Evidence/ Cancer Guideline Description[b]	Source	Date [c] (MM/DD/YY)
4-Methylphenol	NA		--	--		--	--	--
Toluene	NA		--	--		--	--	--
Xylenes	NA		--	--		--	--	--
PAHs[f]	NA		--	--		--	--	--
Benz[a]anthracene	2.1E-04	$(\mu g/m^3)^{-1}$	3500	0.73	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
Benzo[a]pyrene	2.1E-03	$(\mu g/m^3)^{-1}$	3500	7.3	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
Benzo[ghi]perylene	NA		--	--		--	--	--
Benzo[b]fluoranthene	2.1E-04	$(\mu g/m^3)^{-1}$	3500	0.73	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
Benzo[k]fluoranthene	2.1E-05	$(\mu g/m^3)^{-1}$	3500	0.073	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
Dibenz[a,h]anthracene	2.1E-03	$(\mu g/m^3)^{-1}$	3500	7.3	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
Indeno[1,2,3-cd]pyrene	2.1E-04	$(\mu g/m^3)^{-1}$	3500	0.7	$(mg/kg\text{-}day)^{-1}$	--	r[e]	NA
2-Methylnaphthalene								
Naphthalene	NA		--	--		--	--	--
PCBs (sum of detected Aroclors®)	NA		--	--		--	--	--

Note: Toxicity values obtained from U.S. EPA (2005b), unless otherwise specified.

			--	-	not available
CSF	-	carcinogenic slope factor	NA	-	not applicable
EPA	-	U.S. Environmental Protection Agency	NCEA	-	National Center for Environmental Assessment
HEAST	-	Health Effects Assessment Summary Tables	PAH	-	polycyclic aromatic hydrocarbon
IRIS	-	Integrated Risk Information System	r	-	route extrapolation

[a] Adjustment factor applied to Unit Risk to calculate Inhalation Slope Factor = 70 kg×1/20m^3/day×1,000 µg/mg.
Adjustment factor applied to Inhalation Slope Factor to calculate Unit Risk = 20m^3/day x 1/ 70kg x 1/1000 µg/mg.

[b] EPA group:
A - human carcinogen
B2 - probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - possible human carcinogen.

[c] Date represents: IRIS - date is when IRIS was searched.

[d] Because the chemical forms of chromium present are not known, the human health risk assessment conservatively assumes that all chromium is present as chromium(VI).

[e] Carcinogenic slope factor as cited by U.S. EPA Region IX (U.S. EPA 2005a).

[f] Carcinogenic slope factors for PAH compounds are based on potency relative to benzo[a]pyrene as cited by U.S. EPA Region IX (U.S. EPA 2005a).

Scenario Timeframe: Current/Future
Medium: Air
Exposure Medium: Air
Exposure Point: Outdoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.1.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Metals and Organometallic Analytes**													
	Mercury vapor	2.3E-5	mg/m^3	--	2.3E-5	mg/m^3	M	1.5E-6	mg/kg-day	8.6E-05	mg/kg-day	--	--	0.017
	Chromium particulates[c]	2.1E-6	mg/m^3	--	2.1E-6	mg/m^3	M	1.4E-7	mg/kg-day	2.9E-05	mg/kg-day	--	--	0.0048
	(Total)													0.022
													Total Hazard Index Across All Exposure Routes/Pathways:	0.022

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Represents inhalation reference dose for mercury vapor obtained from the inhalation RfC from EPA Integrated Risk Information System (IRIS) (EPA 2005b).
[c]Calculated through application of the EPA 2005a particulate emissions factor and EPA 2005b toxicity values for particulate chromium. UCL for surface soil data in the undeveloped area (See text).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.2.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	2.5E-3	mg/kg-day	8.6E-03	mg/kg-day	--	--	0.29
	(Total)													0.29
													Total Hazard Index Across All Exposure Routes/Pathways:	0.29

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.3.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	6.1E-4	mg/m^3	--	6.1E-4	mg/m^3	M	1.2E-4	mg/kg-day	8.6E-03	mg/kg-day	--	--	0.014
	Chlorobenzene	5.6E-5	mg/m^3	--	5.6E-5	mg/m^3	M	1.1E-5	mg/kg-day	1.7E-02	mg/kg-day	--	--	0.00064
	Chloroethane	4.6E-4	mg/m^3	--	4.6E-4	mg/m^3	M	8.9E-5	mg/kg-day	2.9E+00	mg/kg-day	--	--	0.000031
	1,4-Dichlorobenzene	1.4E-5	mg/m^3	--	1.4E-5	mg/m^3	M	2.8E-6	mg/kg-day	2.3E-01	mg/kg-day	--	--	0.000012
	1,2-Dichloroethene, isomers	2.6E-4	mg/m^3	--	2.6E-4	mg/m^3	M	5.0E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0025
	Toluene	7.6E-3	mg/m^3	--	7.6E-3	mg/m^3	M	1.5E-3	mg/kg-day	1.1E-01	mg/kg-day	--	--	0.014
	Xylenes	1.5E-3	mg/m^3	--	1.5E-3	mg/m^3	M	2.9E-4	mg/kg-day	2.9E-02	mg/kg-day	--	--	0.010
	PAHs													
	Naphthalene	6.5E-5	mg/m^3	--	6.5E-5	mg/m^3	M	1.3E-5	mg/kg-day	8.6E-04	mg/kg-day	--	--	0.015
	(Total)													0.056
													Total Hazard Index Across All Exposure Routes/Pathways:	0.056

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.

[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.4.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Carbazole	6.6E-8	mg/m^3	--	6.6E-8	mg/m^3	M	--	--	ND	--	--	--	--
	Dibenzofuran	3.1E-10	mg/m^3	--	3.1E-10	mg/m^3	M	6.0E-11	mg/kg-day	2.0E-03	mg/kg-day	--	--	0.00000003
	Toluene	6.8E-2	mg/m^3	--	6.8E-2	mg/m^3	M	1.3E-2	mg/kg-day	1.1E-01	mg/kg-day	--	--	0.12
	Xylenes	1.1E-1	mg/m^3		1.1E-1	mg/m^3	M	2.2E-2	mg/kg-day	2.9E-02	mg/kg-day	--	--	0.76
	PAHs													
	Benz[a]anthracene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Benzo[ghi]perylene	1.8E-6	mg/m^3	--	1.8E-6	mg/m^3	M	3.6E-7	mg/kg-day	8.6E-04	mg/kg-day	--	--	0.00042
	Benzo[k]fluoranthene	1.6E-6	mg/m^3	--	1.6E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	1.7E-7	mg/m^3	--	1.7E-7	mg/m^3	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.9E-6	mg/m^3	--	1.9E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Naphthalene	2.1E-2	mg/m^3	--	2.1E-2	mg/m^3	M	4.2E-3	mg/kg-day	8.6E-04	mg/kg-day	--	--	4.8
	(Total)													5.7
													Total Hazard Index Across All Exposure Routes/Pathways:	5.7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.5.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	1.0E-3	mg/m^3	--	1.0E-3	mg/m^3	M	2.0E-4	mg/kg-day	8.6E-03	mg/kg-day	--	--	0.024
	Chlorobenzene	9.4E-5	mg/m^3	--	9.4E-5	mg/m^3	M	1.8E-5	mg/kg-day	1.7E-02	mg/kg-day	--	--	0.0011
	Chloroethane	7.5E-4	mg/m^3	--	7.5E-4	mg/m^3	M	1.5E-4	mg/kg-day	2.9E+00	mg/kg-day	--	--	0.000051
	1,4-Dichlorobenzene	2.4E-5	mg/m^3	--	2.4E-5	mg/m^3	M	4.7E-6	mg/kg-day	2.3E-01	mg/kg-day	--	--	0.000020
	1,2-Dichloroethene, isomers	4.3E-4	mg/m^3	--	4.3E-4	mg/m^3	M	8.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0042
	Toluene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	2.5E-3	mg/kg-day	1.1E-01	mg/kg-day	--	--	0.023
	Xylenes	2.5E-3	mg/m^3	--	2.5E-3	mg/m^3	M	4.9E-4	mg/kg-day	2.9E-02	mg/kg-day	--	--	0.017
	PAHs													
	Naphthalene	1.1E-4	mg/m^3	--	1.1E-4	mg/m^3	M	2.2E-5	mg/kg-day	8.6E-04	mg/kg-day	--	--	0.025
	(Total)													0.094
													Total Hazard Index Across All Exposure Routes/Pathways:	0.094

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference concentration established by EPA.
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (unpaved)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.6.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	11.0	mg/kg	--	11.0	mg/kg	M	5.4E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.018
	Chromium	96.9	mg/kg	--	96.9	mg/kg	M	4.7E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.016
	Copper	470	mg/kg	--	470	mg/kg	M	2.3E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0057
	Manganese	540	mg/kg	--	540	mg/kg	M	2.6E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0057
	Mercury (total)	310	mg/kg	--	310	mg/kg	M	1.5E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.51
	Vanadium	140	mg/kg	--	140	mg/kg	M	6.8E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0076
	Organic Analytes													
	PAHs													
	Benzo[a]pyrene	0.41	mg/kg	--	0.41	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.75	mg/kg	--	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.071	mg/kg	--	0.071	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.56
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	11.0	mg/kg	0.03	11.0	mg/kg	M	2.1E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0071
	Organic Analytes													
	PAHs													
	Benzo[a]pyrene	0.41	mg/kg	0.13	0.41	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.75	mg/kg	0.13	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.071	mg/kg	0.13	0.071	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.0071
													Total Hazard Index Across All Exposure Routes/Pathways:	0.57

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.7.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	3.0E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.010
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	3.7E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.012
	Copper	6274	mg/kg	--	6274	mg/kg	M	3.1E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.077
	Manganese	343	mg/kg	--	343	mg/kg	M	1.7E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0036
	Mercury (total)	1312	mg/kg	--	1312	mg/kg	M	6.4E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	2.1
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	1.4E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.017
	Vanadium	140	mg/kg	--	140	mg/kg	M	6.8E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0076
	Organic Analytes													
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	1.4E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00034
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													2.3
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	1.2E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0040
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.0040
													Total Hazard Index Across All Exposure Routes/Pathways:	2.3

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.8.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	3.0E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.010
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	3.7E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.012
	Copper	6274	mg/kg	--	6274	mg/kg	M	3.1E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.077
	Manganese	343	mg/kg	--	343	mg/kg	M	1.7E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0036
	Mercury (total) Hot Spot Value	3861	mg/kg	--	3861	mg/kg	M	1.9E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.63
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	1.4E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.017
	Vanadium	140	mg/kg	--	140	mg/kg	M	6.8E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0076
	Organic Analytes													
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	1.4E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00034
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.7	mg/kg	--	0.7	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.76
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	1.2E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0040
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.0040
													Total Hazard Index Across All Exposure Routes/Pathways:	0.76

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Developed Area Subsurface Soil (1-20 ft)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 7.9.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	7.7E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.026
	Barium	818	mg/kg	--	818	mg/kg	M	6.3E-4	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.0091
	Chromium	131	mg/kg	--	131	mg/kg	M	1.0E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.034
	Copper	7420	mg/kg	--	7420	mg/kg	M	5.8E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.14
	Manganese	812	mg/kg	--	812	mg/kg	M	6.3E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.013
	Mercury (total)	2908	mg/kg	--	2908	mg/kg	M	2.3E-3	mg/kg-day	3.0E-04	mg/kg-day	--	--	7.5
	Thallium	5.4	mg/kg	--	5.4	mg/kg	M	4.2E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.052
	Organic Analytes													
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	2.2E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00054
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	1.8E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00046
	PCBs (as Aroclor 1254)	0.36	mg/kg	--	0.36	mg/kg	M	2.8E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.014
	(Total)													7.8
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	4.6E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0015
	Organic Analytes													
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	4.8E-07	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00012
	PCBs (as Aroclor 1254)	0.36	mg/kg	0.14	0.36	mg/kg	M	7.8E-08	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0039
	(Total)													0.0056
													Total Hazard Index Across All Exposure Routes/Pathways:	7.8

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.10.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	6.2E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.016
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	4.9E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.016
	Barium	5115	mg/kg	--	5115	mg/kg	M	2.5E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.036
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	3.2E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0032
	Chromium	2822	mg/kg	--	2822	mg/kg	M	1.4E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.46
	Copper	277	mg/kg	--	277	mg/kg	M	1.4E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0034
	Manganese	514	mg/kg	--	514	mg/kg	M	2.5E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0054
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	8.9E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.30
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	1.6E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0016
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	2.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	1.1E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0022
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	5.0E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.062
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	3.3E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0037
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.2E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.039
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	9.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0047
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	2.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	3.1E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00077
	PCBs as Aroclor 1254	4.4	mg/kg	--	5.0	mg/kg	M	2.2E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.11
	(Total)													1.1
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0064
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	4.2E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.00083
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.2E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0062
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	4.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0021
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	5.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0013
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	4.0E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.20
	(Total)													0.22
													Total Hazard Index Across All Exposure Routes/Pathways:	1.3

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.11.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	6.2E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.016
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	4.9E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.016
	Barium	5115	mg/kg	--	5115	mg/kg	M	2.5E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.036
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	3.2E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0032
	Chromium	2822	mg/kg	--	2822	mg/kg	M	1.4E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.46
	Copper	277	mg/kg	--	277	mg/kg	M	1.4E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0034
	Manganese	514	mg/kg	--	514	mg/kg	M	2.5E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0054
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	4.0E-3	mg/kg-day	3.0E-04	mg/kg-day	--	--	13
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	1.6E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0016
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	2.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	1.1E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0022
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	5.0E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.062
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	3.3E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0037
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.2E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.039
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	9.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0047
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	2.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	3.1E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00077
	PCBs as Aroclor 1254	4.4	mg/kg	--	5.0	mg/kg	M	2.2E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.11
	(Total)													14
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0064
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	4.2E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.00083
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.2E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0062
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	4.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0021
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	5.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0013
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	4.0E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.20
	(Total)													0.22
													Total Hazard Index Across All Exposure Routes/Pathways:	14

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.

[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).

[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.12.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	4.5E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.015
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	4.7E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0047
	Chromium	156	mg/kg	--	156	mg/kg	M	8.1E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.027
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	6.7E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	2.2
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	6.5E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00065
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	2.5E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.031
	Vanadium	69.4	mg/kg	--	69.4	mg/kg	M	3.6E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0040
	Zinc	3540	mg/kg	--	3540	mg/kg	M	1.8E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.0061
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	--	0.73	mg/kg	M	3.8E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.019
	(Total)													2.3
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0078
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	8.0E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.0016
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	0.14	0.73	mg/kg	M	9.0E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.045
	(Total)													0.055
													Total Hazard Index Across All Exposure Routes/Pathways:	2.4

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 7.13.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	6.5E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.022
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	6.7E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0067
	Chromium	156	mg/kg	--	156	mg/kg	M	1.2E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.038
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	9.5E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	3.2
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	9.3E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00093
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	3.5E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.044
	Vanadium	69.4	mg/kg	--	69.4	mg/kg	M	5.1E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0057
	Zinc	3540	mg/kg	--	3540	mg/kg	M	2.6E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.0087
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	--	0.73	mg/kg	M	5.4E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.027
	(Total)													3.3
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	2.3E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0078
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	8.1E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.0016
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	0.14	0.73	mg/kg	M	9.1E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.045
	(Total)													0.055
													Total Hazard Index Across All Exposure Routes/Pathways:	3.4

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.14.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	6.6E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.016
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	5.1E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.017
	Barium	5115	mg/kg	--	5115	mg/kg	M	2.6E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.038
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	3.3E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0033
	Chromium	2822	mg/kg	--	2822	mg/kg	M	1.5E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.49
	Copper	277	mg/kg	--	277	mg/kg	M	1.4E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0036
	Manganese	514	mg/kg	--	514	mg/kg	M	2.7E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0057
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	9.4E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.31
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	1.7E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0017
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	2.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0013
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	1.1E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0023
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	5.2E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.065
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	3.5E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0039
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.2E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.041
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	9.9E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0050
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	2.5E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0013
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	3.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00082
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	2.3E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.11
	(Total)													1.1
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0088
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	5.7E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.0011
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0085
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	5.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0028
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	7.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0018
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	5.4E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.27
	(Total)													0.30
													Total Hazard Index Across All Exposure Routes/Pathways:	1.4

Note:
-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 7.15.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	9.4E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.023
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	7.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.024
	Barium	5115	mg/kg	--	5115	mg/kg	M	3.8E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.054
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	4.8E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0048
	Chromium	2822	mg/kg	--	2822	mg/kg	M	2.1E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.69
	Copper	277	mg/kg	--	277	mg/kg	M	2.0E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0051
	Manganese	514	mg/kg	--	514	mg/kg	M	3.8E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0081
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	1.3E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.45
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	2.4E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0024
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	3.7E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0018
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	1.6E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0033
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	7.5E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.094
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	5.0E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0056
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.8E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.059
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	1.4E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0071
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	3.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0018
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	4.7E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0012
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	3.2E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.16
	(Total)													1.6
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0088
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	5.7E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.0011
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0085
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	5.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0028
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	7.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0018
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	5.5E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.27
	(Total)													0.30
													Total Hazard Index Across All Exposure Routes/Pathways:	1.9

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.16.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	6.6E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.016
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	5.1E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.017
	Barium	5115	mg/kg	--	5115	mg/kg	M	2.6E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.038
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	3.3E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0033
	Chromium	2822	mg/kg	--	2822	mg/kg	M	1.5E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.49
	Copper	277	mg/kg	--	277	mg/kg	M	1.4E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0036
	Manganese	514	mg/kg	--	514	mg/kg	M	2.7E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0057
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	4.2E-3	mg/kg-day	3.0E-04	mg/kg-day	--	--	14
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	1.7E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0017
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	2.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0013
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	1.1E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0023
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	5.2E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.065
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	3.5E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0039
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.2E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.041
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	9.9E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0050
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	2.5E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0013
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	3.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00082
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	2.3E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.11
	(Total)													15
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0088
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	5.7E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.0011
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0085
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	5.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0028
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	7.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0018
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	5.4E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.27
	(Total)													0.30

Total Hazard Index Across All Exposure Routes/Pathways: 15

Note:
-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 7.17.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	9.4E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.023
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	7.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.024
	Barium	5115	mg/kg	--	5115	mg/kg	M	3.8E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.054
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	4.8E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0048
	Chromium	2822	mg/kg	--	2822	mg/kg	M	2.1E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.69
	Copper	277	mg/kg	--	277	mg/kg	M	2.0E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0051
	Manganese	514	mg/kg	--	514	mg/kg	M	3.8E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0081
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	6.0E-3	mg/kg-day	3.0E-04	mg/kg-day	--	--	20
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	2.4E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0024
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	3.7E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0018
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	1.6E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0033
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	7.5E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.094
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	5.0E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0056
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.8E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.059
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	1.4E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0071
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	3.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0018
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	4.7E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0012
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	3.2E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.16
	(Total)													21
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0088
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	5.7E-8	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.0011
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0085
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	5.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0028
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	7.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0018
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	5.5E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.27
	(Total)													0.30
													Total Hazard Index Across All Exposure Routes/Pathways:	21

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 7.18.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	11.4	mg/kg	--	11.4	mg/kg	M	8.8E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.022
	Arsenic	18.6	mg/kg	--	18.6	mg/kg	M	1.4E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.048
	Barium	1855	mg/kg	--	1855	mg/kg	M	1.4E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.021
	Cadmium	7.5	mg/kg	--	7.5	mg/kg	M	5.8E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0058
	Chromium	1488	mg/kg	--	1488	mg/kg	M	1.2E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.38
	Copper	1521	mg/kg	--	1521	mg/kg	M	1.2E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.029
	Manganese	3655	mg/kg	--	3655	mg/kg	M	2.8E-3	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.061
	Mercury (total)	732	mg/kg	--	732	mg/kg	M	5.7E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	1.9
	Methylmercury	0.0074	mg/kg	--	0.0074	mg/kg	M	5.8E-9	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.000058
	Nickel	80.6	mg/kg	--	80.6	mg/kg	M	6.2E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0031
	Selenium	7.4	mg/kg	--	7.4	mg/kg	M	5.8E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0012
	Silver	24.4	mg/kg	--	24.4	mg/kg	M	1.9E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0038
	Thallium	4.2	mg/kg	--	4.2	mg/kg	M	3.2E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.040
	Vanadium	271	mg/kg	--	271	mg/kg	M	2.1E-4	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.023
	Zinc	7451	mg/kg	--	7451	mg/kg	M	5.8E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.019
	Organic Analytes													
	Carbazole	3.7	mg/kg	--	3.7	mg/kg	M	--	--	ND	--	--	--	--
	Dibenzofuran	4.5	mg/kg	--	4.5	mg/kg	M	3.5E-6	mg/kg-day	2.0E-03	mg/kg-day	--	--	0.0018
	Toluene	19	mg/kg	--	19	mg/kg	M	1.5E-5	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.000074
	Xylenes	31	mg/kg	--	31	mg/kg	M	2.4E-5	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.00012
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	1.8E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00046
	Benz[a]anthracene	18	mg/kg	--	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	15	mg/kg	--	15	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	18	mg/kg	--	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[ghi]perylene	2.9	mg/kg	--	2.9	mg/kg	M	2.3E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00011
	Benzo[k]fluoranthene	2.5	mg/kg	--	2.5	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.26	mg/kg	--	0.26	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	--	3.1	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	6.0	mg/kg	--	6.0	mg/kg	M	4.6E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00023
	PCBs (as Aroclor 1254)	4.4	mg/kg	--	4.4	mg/kg	M	3.4E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.17
	(Total)													2.7

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 7.18.RME (continued)
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	**Metals and Organometallic Analytes**													
Absorption	Arsenic	18.6	mg/kg	0.03	18.6	mg/kg	M	8.7E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0029
	Cadmium	7.5	mg/kg	0.001	7.5	mg/kg	M	1.2E-08	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.00023
	Organic Analytes													
	Carbazole	3.7	mg/kg	0.10	3.7	mg/kg	M	--	--	ND	--	--	--	--
	Dibenzofuran	4.5	mg/kg	0.10	4.5	mg/kg	M	7.0E-07	mg/kg-day	2.0E-03	mg/kg-day	--	--	0.00035
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	4.8E-07	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00012
	Benz[a]anthracene	18	mg/kg	0.13	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	15	mg/kg	0.13	15	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	18	mg/kg	0.13	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[ghi]perylene	2.9	mg/kg	0.13	2.9	mg/kg	M	5.916E-07	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000030
	Benzo[k]fluoranthene	2.5	mg/kg	0.13	2.5	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.26	mg/kg	0.13	0.26	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	0.13	3.1	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	6.0	mg/kg	0.13	6.0	mg/kg	M	1.2E-06	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000060
	PCBs (as Aroclor 1254)	4.4	mg/kg	0.14	4.4	mg/kg	M	9.5E-07	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.048
	(Total)													0.051
										Total Hazard Index Across All Exposure Routes/Pathways:				2.8

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.19.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	--	0.41	mg/L	M	2.6E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.00055
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	1.1E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0036
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	1.7E-10	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0000017
	(Total)													0.0042
Dermal Absorption	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	1.2E-5	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.0065
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	5.2E-7	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.025
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	8.2E-11	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00000082
	(Total)													0.031
													Total Hazard Index Across All Exposure Routes/Pathways:	0.035

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser
Receptor Age: Adolescent/Pre-Adolescent

Table 7.20.RME
Calculation of Noncancer Hazards
Adult Surface Water Exposure: Reasonable Maximum Recreational Scenario
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	--	0.41	mg/L	M	3.7E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.00078
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	1.6E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0052
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	2.5E-10	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0000025
	(Total)													0.0060
Dermal Absorption	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	1.2E-5	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.0065
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	5.2E-7	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.025
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	8.2E-11	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00000082
	(Total)													0.031
													Total Hazard Index Across All Exposure Routes/Pathways:	0.037

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.21.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	9.2E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.31
	Barium	0.42	mg/L	--	0.42	mg/L	M	4.1E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.059
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	2.7E-5	mg/kg-day	5.0E-04	mg/kg-day	--	--	0.055
	Copper	0.096	mg/L	--	0.096	mg/L	M	9.4E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.024
	Manganese	1.9	mg/L	--	1.9	mg/L	M	1.9E-2	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.40
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	1.9E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.62
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	1.0E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0010
	Nickel	0.042	mg/L	--	0.042	mg/L	M	4.1E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.021
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	5.6E-5	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.69
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	4.6E-4	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.051
	Organic Analytes													
	Benzene	0.060	mg/L	--	0.060	mg/L	M	5.9E-4	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.15
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	9.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0048
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	8.5E-5	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.00021
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	2.2E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.011
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	3.9E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0013
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	2.8E-4	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.056
	Toluene	0.71	mg/L	--	0.71	mg/L	M	7.0E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.035
	Xylene	0.16	mg/L	--	0.16	mg/L	M	1.6E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0080
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	9.8E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0024
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	4.3E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.022
	(Total)													2.5

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.21.RME (continued)
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	**Metals and Organometallic Analytes**													
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	2.4E-9	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0000081
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	1.1E-7	mg/kg-day	4.9E-03	mg/kg-day	--	--	0.000022
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	7.3E-10	mg/kg-day	1.3E-05	mg/kg-day	--	--	0.000058
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	2.5E-8	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00000062
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	5.0E-7	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.00027
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	4.9E-9	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.00023
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	2.7E-12	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.000000027
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	1.1E-9	mg/kg-day	8.0E-04	mg/kg-day	--	--	0.0000014
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	1.5E-9	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.000018
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	1.2E-8	mg/kg-day	2.3E-04	mg/kg-day	--	--	0.000052
	Organic Analytes													
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	3.3E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000081
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	1.0E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0000052
	Chloroethane	0.0087	mg/L	0.0080	0.0087	mg/L	M	1.8E-8	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000000045
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	7.7E-9	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00000038
	1,4-Dichlorobenzene	0.004	mg/L	0.062	0.004	mg/L	M	6.4E-8	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0000021
	4-Methylphenol	0.028	mg/L	0.004	0.028	mg/L	M	3.2E-8	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0000063
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	8.3E-6	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.000041
	Xylene	0.16	mg/L	0.080	0.16	mg/L	M	3.4E-6	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.000017
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	1.8E-8	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0000045
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	7.9E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000040
	(Total)													0.00086
													Total Hazard Index Across All Exposure Routes/Pathways:	2.5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 7.22.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	2.6E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.86
	Barium	0.4215	mg/L	--	0.4215	mg/L	M	1.2E-2	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.16
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	7.7E-5	mg/kg-day	5.0E-04	mg/kg-day	--	--	0.15
	Copper	0.0962	mg/L	--	0.0962	mg/L	M	2.6E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.066
	Manganese	1.9	mg/L	--	1.9	mg/L	M	5.3E-2	mg/kg-day	4.7E-02	mg/kg-day	--	--	1.1
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	5.2E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	1.7
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	2.9E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0029
	Nickel	0.042	mg/L	--	0.042	mg/L	M	1.1E-3	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.057
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	1.6E-4	mg/kg-day	8.0E-05	mg/kg-day	--	--	1.9
	Vanadium	0.0470	mg/L	--	0.0470	mg/L	M	1.3E-3	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.14
	Organic Analytes													
	Benzene	0.06	mg/L	--	0.06	mg/L	M	1.6E-3	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.41
	Chlorobenzene	0.010	mg/L	--	0.010	mg/L	M	2.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.013
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	2.4E-4	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.00060
	1,2-Dichloroethene, isomers	0.0228	mg/L	--	0.0228	mg/L	M	6.2E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.031
	1,4-Dichlorobenzene	0.004	mg/L	--	0.004	mg/L	M	1.1E-4	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0037
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	7.8E-4	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.16
	Toluene	0.71	mg/L	--	0.71	mg/L	M	1.9E-2	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.097
	Xylene	0.16	mg/L	--	0.16	mg/L	M	4.5E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.023
	PAHs													
	2-Methylnaphthalene	0.001	mg/L	--	0.001	mg/L	M	2.7E-5	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0068
	Naphthalene	0.0444	mg/L	--	0.0444	mg/L	M	1.2E-3	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.061
	(Total)													7.1

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 7.22.RME (Continued)
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	**Metals and Organometallic Analytes**													
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	1.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0045
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	6.0E-5	mg/kg-day	4.9E-03	mg/kg-day	--	--	0.012
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	4.0E-7	mg/kg-day	1.3E-05	mg/kg-day	--	--	0.032
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	1.4E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00034
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	2.7E-4	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.15
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	2.7E-6	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.13
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	1.5E-9	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.000015
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	6.0E-7	mg/kg-day	8.0E-04	mg/kg-day	--	--	0.00075
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	8.1E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.010
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	6.7E-6	mg/kg-day	2.3E-04	mg/kg-day	--	--	0.029
	Organic Analytes													
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	1.8E-4	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.045
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	5.7E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0029
	Chloroethane	0.0087	mg/L	0.0080	0.0087	mg/L	M	1.0E-5	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000025
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	4.2E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00021
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	3.5E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0012
	4-Methylphenol	0.028	mg/L	0.004	0.028	mg/L	M	1.7E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0035
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	4.6E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.023
	Xylene	0.16	mg/L	0.080	0.16	mg/L	M	1.9E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0094
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	9.9E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0025
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	4.4E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.022
	(Total)													0.48
													Total Hazard Index Across All Exposure Routes/Pathways:	7.5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Adult

Table 7.23.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	1.8	mg/m^3	--	1.8	mg/m^3	M	4.3E-2	mg/m^3	3.0E-02	mg/m^3	--	--	1.4
	Chlorobenzene	0.29	mg/m^3	--	0.29	mg/m^3	M	7.0E-3	mg/m^3	6.0E-02	mg/m^3	--	--	0.12
	Chloroethane	0.26	mg/m^3	--	0.26	mg/m^3	M	6.2E-3	mg/m^3	1.0E+01	mg/m^3	--	--	0.00062
	1,4-Dichlorobenzene	0.12	mg/m^3	--	0.12	mg/m^3	M	2.8E-3	mg/m^3	8.0E-01	mg/m^3	--	--	0.0036
	1,2-Dichloroethene, isomers	0.67	mg/m^3	--	0.67	mg/m^3	M	1.6E-2	mg/m^3	7.0E-02	mg/m^3	--	--	0.23
	4-Methylphenol	0.83	mg/m^3	--	0.83	mg/m^3	M	2.0E-2	mg/m^3	1.8E-02	mg/m^3	--	--	1.2
	Toluene	21	mg/m^3	--	21	mg/m^3	M	5.1E-1	mg/m^3	4.0E-01	mg/m^3	--	--	1.3
	Xylenes	4.8	mg/m^3	--	4.8	mg/m^3	M	1.2E-1	mg/m^3	1.0E-01	mg/m^3	--	--	1.2
	PAHs													
	Naphthalene	1.3	mg/m^3	--	1.3	mg/m^3	M	3.2E-2	mg/m^3	3.0E-03	mg/m^3	--	--	11
	(Total)													16
													Total Hazard Index Across All Exposure Routes/Pathways:	16

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 7.24.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	9.0E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	3.0
	Barium	0.42	mg/L	--	0.42	mg/L	M	4.0E-2	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.58
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	2.7E-4	mg/kg-day	5.0E-04	mg/kg-day	--	--	0.54
	Copper	0.096	mg/L	--	0.096	mg/L	M	9.2E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.23
	Manganese	1.9	mg/L	--	1.9	mg/L	M	1.8E-1	mg/kg-day	4.7E-02	mg/kg-day	--	--	3.9
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	1.8E-3	mg/kg-day	3.0E-04	mg/kg-day	--	--	6.1
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	1.0E-6	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.010
	Nickel	0.042	mg/L	--	0.042	mg/L	M	4.0E-3	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.20
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	5.4E-4	mg/kg-day	8.0E-05	mg/kg-day	--	--	6.8
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	4.5E-3	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.50
	Organic Analytes													
	Benzene	0.060	mg/L	--	0.060	mg/L	M	5.7E-3	mg/kg-day	4.0E-03	mg/kg-day	--	--	1.4
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	9.4E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.047
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	8.3E-4	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.0021
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	2.2E-3	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.11
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	3.8E-4	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.013
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	2.7E-3	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.54
	Toluene	0.71	mg/L	--	0.71	mg/L	M	6.8E-2	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.34
	Xylene	0.16	mg/L	--	0.16	mg/L	M	1.6E-2	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.079
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	9.6E-5	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.024
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	4.3E-3	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.21
	(Total)													25

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 7.24.RME (Continued)
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	4.0E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.013
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	1.8E-4	mg/kg-day	4.9E-03	mg/kg-day	--	--	0.036
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	1.2E-6	mg/kg-day	1.3E-05	mg/kg-day	--	--	0.095
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	4.1E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0010
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	8.1E-4	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.43
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	8.0E-6	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.38
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	4.5E-9	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.000045
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	1.8E-6	mg/kg-day	8.0E-04	mg/kg-day	--	--	0.0022
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	2.4E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.030
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	2.0E-5	mg/kg-day	2.3E-04	mg/kg-day	--	--	0.085
	Organic Analytes													
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	5.3E-4	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.13
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	1.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0085
	Chloroethane	0.0087	mg/L	0.0080	0.0087	mg/L	M	2.9E-5	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000073
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	1.2E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00062
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	1.0E-4	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0035
	4-Methylphenol	0.028	mg/L	0.004	0.028	mg/L	M	5.1E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.010
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	1.3E-2	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.067
	Xylene	0.16	mg/L	0.080	0.16	mg/L	M	5.5E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.028
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	2.9E-5	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0073
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	1.3E-3	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.065
	(Total)													1.4
													Total Hazard Index Across All Exposure Routes/Pathways:	26

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Child

Table 7.25.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	3.1	mg/m^3	--	3.1	mg/m^3	M	1.3E-1	mg/m^3	3.0E-02	mg/m^3	--	--	4.4
	Chlorobenzene	0.51	mg/m^3	--	0.51	mg/m^3	M	2.1E-2	mg/m^3	6.0E-02	mg/m^3	--	--	0.36
	Chloroethane	0.46	mg/m^3	--	0.46	mg/m^3	M	1.9E-2	mg/m^3	1.0E+01	mg/m^3	--	--	0.0019
	1,4-Dichlorobenzene	0.21	mg/m^3	--	0.21	mg/m^3	M	8.7E-3	mg/m^3	8.0E-01	mg/m^3	--	--	0.011
	1,2-Dichloroethene, isomers	1.2	mg/m^3	--	1.2	mg/m^3	M	5.0E-2	mg/m^3	7.0E-02	mg/m^3	--	--	0.71
	4-Methylphenol	1.5	mg/m^3	--	1.5	mg/m^3	M	6.2E-2	mg/m^3	1.8E-02	mg/m^3	--	--	3.5
	Toluene	37	mg/m^3	--	37	mg/m^3	M	1.5E+0	mg/m^3	4.0E-01	mg/m^3	--	--	3.9
	Xylenes	8.6	mg/m^3	--	8.6	mg/m^3	M	3.6E-1	mg/m^3	1.0E-01	mg/m^3	--	--	3.6
	PAHs													
	Naphthalene	2.3	mg/m^3	--	2.3	mg/m^3	M	9.7E-2	mg/m^3	3.0E-03	mg/m^3	--	--	32
	(Total)													49
													Total Hazard Index Across All Exposure Routes/Pathways:	49

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Air
Exposure Medium: Air
Exposure Point: Outdoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.1.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Metals and Organometallic Analytes**													
	Mercury vapor	2.3E-5	mg/m^3	--	2.3E-5	mg/m^3	M	5.1E-7	mg/kg-day	8.6E-05	mg/kg-day	--	--	0.0059
	Chromium particulates[c]	2.1E-6	mg/m^3	--	2.1E-6	mg/m^3	M	4.8E-8	mg/kg-day	2.9E-05	mg/kg-day	--	--	0.0017
	(Total)													0.0076
													Total Hazard Index Across All Exposure Routes/Pathways:	0.0076

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.

[b]Represents inhalation reference dose for mercury vapor obtained from the inhalation RfC from EPA Integrated Risk Information System (IRIS) (EPA 2005b).

[c]Calculated through application of the EPA 2005a particulate emissions factor and EPA 2005b toxicity values for particulate chromium. UCL for surface soil data in the undeveloped area (See text).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.2.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	9.8E-4	mg/kg-day	8.6E-03	mg/kg-day	--	--	0.11
	(Total)													0.11
													Total Hazard Index Across All Exposure Routes/Pathways:	0.11

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.3.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	6.1E-4	mg/m^3	--	6.1E-4	mg/m^3	M	4.7E-5	mg/kg-day	8.6E-03	mg/kg-day	--	--	0.0055
	Chlorobenzene	5.6E-5	mg/m^3	--	5.6E-5	mg/m^3	M	4.3E-6	mg/kg-day	1.7E-02	mg/kg-day	--	--	0.00025
	Chloroethane	4.6E-4	mg/m^3	--	4.6E-4	mg/m^3	M	3.5E-5	mg/kg-day	2.9E+00	mg/kg-day	--	--	0.000012
	1,4-Dichlorobenzene	1.4E-5	mg/m^3	--	1.4E-5	mg/m^3	M	1.1E-6	mg/kg-day	2.3E-01	mg/kg-day	--	--	0.0000048
	1,2-Dichloroethene, isomers	2.6E-4	mg/m^3	--	2.6E-4	mg/m^3	M	2.0E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0010
	Toluene	7.6E-3	mg/m^3	--	7.6E-3	mg/m^3	M	5.9E-4	mg/kg-day	1.1E-01	mg/kg-day	--	--	0.0053
	Xylenes	1.5E-3	mg/m^3	--	1.5E-3	mg/m^3	M	1.1E-4	mg/kg-day	2.9E-02	mg/kg-day	--	--	0.0040
	PAHs													
	Naphthalene	6.5E-5	mg/m^3	--	6.5E-5	mg/m^3	M	5.0E-6	mg/kg-day	8.6E-04	mg/kg-day	--	--	0.0059
	(Total)													0.022
													Total Hazard Index Across All Exposure Routes/Pathways:	0.022

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.

[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.4.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Carbazole	6.6E-8	mg/m^3	--	6.6E-8	mg/m^3	M	--	--	ND	--	--	--	--
	Dibenzofuran	3.1E-10	mg/m^3	--	3.1E-10	mg/m^3	M	2.4E-11	mg/kg-day	2.0E-03	mg/kg-day	--	--	0.00000001
	Toluene	6.8E-2	mg/m^3	--	6.8E-2	mg/m^3	M	5.3E-3	mg/kg-day	1.1E-01	mg/kg-day	--	--	0.046
	Xylenes	1.1E-1	mg/m^3		1.1E-1	mg/m^3	M	8.6E-3	mg/kg-day	2.9E-02	mg/kg-day	--	--	0.30
	PAHs													
	Benz[a]anthracene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Benzo[ghi]perylene	1.8E-6	mg/m^3	--	1.8E-6	mg/m^3	M	1.4E-7	mg/kg-day	8.6E-04	mg/kg-day	--	--	0.00017
	Benzo[k]fluoranthene	1.6E-6	mg/m^3	--	1.6E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	1.7E-7	mg/m^3	--	1.7E-7	mg/m^3	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.9E-6	mg/m^3	--	1.9E-6	mg/m^3	M	--	--	ND	--	--	--	--
	Naphthalene	2.1E-2	mg/m^3	--	2.1E-2	mg/m^3	M	1.6E-3	mg/kg-day	8.6E-04	mg/kg-day	--	--	1.9
	(Total)													2.3
													Total Hazard Index Across All Exposure Routes/Pathways:	2.3

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.5.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	1.0E-3	mg/m^3	--	1.0E-3	mg/m^3	M	8.0E-5	mg/kg-day	8.6E-03	mg/kg-day	--	--	0.0093
	Chlorobenzene	9.4E-5	mg/m^3	--	9.4E-5	mg/m^3	M	7.2E-6	mg/kg-day	1.7E-02	mg/kg-day	--	--	0.00043
	Chloroethane	7.5E-4	mg/m^3	--	7.5E-4	mg/m^3	M	5.8E-5	mg/kg-day	2.9E+00	mg/kg-day	--	--	0.000020
	1,4-Dichlorobenzene	2.4E-5	mg/m^3	--	2.4E-5	mg/m^3	M	1.8E-6	mg/kg-day	2.3E-01	mg/kg-day	--	--	0.0000080
	1,2-Dichloroethene, isomers	4.3E-4	mg/m^3	--	4.3E-4	mg/m^3	M	3.3E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0017
	Toluene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	9.9E-4	mg/kg-day	1.1E-01	mg/kg-day	--	--	0.0090
	Xylenes	2.5E-3	mg/m^3	--	2.5E-3	mg/m^3	M	1.9E-4	mg/kg-day	2.9E-02	mg/kg-day	--	--	0.0067
	PAHs													
	Naphthalene	1.1E-4	mg/m^3	--	1.1E-4	mg/m^3	M	8.5E-6	mg/kg-day	8.6E-04	mg/kg-day	--	--	0.010
	(Total)													0.037
													Total Hazard Index Across All Exposure Routes/Pathways:	0.037

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference concentration established by EPA.
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (unpaved)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.6.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	11.0	mg/kg	--	11.0	mg/kg	M	4.7E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.016
	Chromium	96.9	mg/kg	--	96.9	mg/kg	M	4.2E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.014
	Copper	470	mg/kg	--	470	mg/kg	M	2.0E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0050
	Manganese	540	mg/kg	--	540	mg/kg	M	2.3E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0050
	Mercury (total)	310	mg/kg	--	310	mg/kg	M	1.3E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.44
	Vanadium	140	mg/kg	--	140	mg/kg	M	6.0E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0067
	Organic Analytes													
	PAHs													
	Benzo[a]pyrene	0.41	mg/kg	--	0.41	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.75	mg/kg	--	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.071	mg/kg	--	0.071	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.49
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	11.0	mg/kg	0.03	11.0	mg/kg	M	1.9E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00062
	Organic Analytes													
	PAHs													
	Benzo[a]pyrene	0.41	mg/kg	0.13	0.41	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.75	mg/kg	0.13	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.071	mg/kg	0.13	0.071	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.00062
													Total Hazard Index Across All Exposure Routes/Pathways:	0.49

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.7.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	2.7E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0089
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	3.2E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.011
	Copper	6274	mg/kg	--	6274	mg/kg	M	2.7E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.067
	Manganese	343	mg/kg	--	343	mg/kg	M	1.5E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0031
	Mercury (total)	1312	mg/kg	--	1312	mg/kg	M	5.6E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	1.9
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	1.2E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.015
	Vanadium	140	mg/kg	--	140	mg/kg	M	6.0E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0067
	Organic Analytes													
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	1.2E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00030
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													2.0
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	1.1E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00035
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.00035
													Total Hazard Index Across All Exposure Routes/Pathways:	2.0

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.8.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	2.7E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0089
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	3.2E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.011
	Copper	6274	mg/kg	--	6274	mg/kg	M	2.7E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.067
	Manganese	343	mg/kg	--	343	mg/kg	M	1.5E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0031
	Mercury (total) Hot Spot Value	3861	mg/kg	--	3861	mg/kg	M	8.3E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.28
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	1.2E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.015
	Vanadium	140	mg/kg	--	140	mg/kg	M	6.0E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0067
	Organic Analytes													
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	1.2E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00030
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.39
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	1.1E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00035
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	--	--	ND	--	--	--	--
	(Total)													0.00035
													Total Hazard Index Across All Exposure Routes/Pathways:	0.39

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Developed Area Subsurface Soil (1-20 ft)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 7.9.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	9.7E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0032
	Barium	818	mg/kg	--	818	mg/kg	M	8.0E-5	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.0011
	Chromium	131	mg/kg	--	131	mg/kg	M	1.3E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.0043
	Copper	7420	mg/kg	--	7420	mg/kg	M	7.3E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.018
	Manganese	812	mg/kg	--	812	mg/kg	M	7.9E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0017
	Mercury (total)	2908	mg/kg	--	2908	mg/kg	M	2.8E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.95
	Thallium	5.4	mg/kg	--	5.4	mg/kg	M	5.3E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.0066
	Organic Analytes													
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	2.7E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000068
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	2.3E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000058
	PCBs (as Aroclor 1254)	0.36	mg/kg	--	0.36	mg/kg	M	3.5E-8	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0018
	(Total)													0.99
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	9.6E-08	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00032
	Organic Analytes													
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	1.0E-07	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000025
	PCBs (as Aroclor 1254)	0.36	mg/kg	0.14	0.36	mg/kg	M	1.6E-08	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.00081
	(Total)													0.0012
													Total Hazard Index Across All Exposure Routes/Pathways:	0.99

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.10.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	5.4E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.014
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	4.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.014
	Barium	5115	mg/kg	--	5115	mg/kg	M	2.2E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.031
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	2.8E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0028
	Chromium	2822	mg/kg	--	2822	mg/kg	M	1.2E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.40
	Copper	277	mg/kg	--	277	mg/kg	M	1.2E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0030
	Manganese	514	mg/kg	--	514	mg/kg	M	2.2E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0047
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	7.8E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.26
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	1.4E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0014
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	2.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0011
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	9.5E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0019
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	4.3E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.054
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	2.9E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0033
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.0E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.034
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	8.2E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0041
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49.0	mg/kg	--	49.0	mg/kg	M	2.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0010
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	2.7E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00068
	PCBs as Aroclor 1254	4.4	mg/kg	--	5.0	mg/kg	M	1.9E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.094
	(Total)													0.93
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00056
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	3.6E-9	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000073
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00054
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49.0	mg/kg	0.13	49.0	mg/kg	M	3.6E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00018
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	4.7E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00012
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	3.5E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.017
	(Total)													0.019
													Total Hazard Index Across All Exposure Routes/Pathways:	0.95

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.11.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	5.4E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.014
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	4.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.014
	Barium	5115	mg/kg	--	5115	mg/kg	M	2.2E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.031
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	2.8E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0028
	Chromium	2822	mg/kg	--	2822	mg/kg	M	1.2E-3	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.40
	Copper	277	mg/kg	--	277	mg/kg	M	1.2E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0030
	Manganese	514	mg/kg	--	514	mg/kg	M	2.2E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0047
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	1.7E-3	mg/kg-day	3.0E-04	mg/kg-day	--	--	5.8
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	1.4E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0014
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	2.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0011
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	9.5E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0019
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	4.3E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.054
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	2.9E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0033
	Zinc	23985	mg/kg	--	23985	mg/kg	M	1.0E-2	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.034
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	8.2E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0041
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	2.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0010
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	2.7E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00068
	PCBs as Aroclor 1254	4.4	mg/kg	--	5.0	mg/kg	M	1.9E-6	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.094
	(Total)													6.4
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00056
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	3.6E-9	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000073
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00054
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	3.6E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00018
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	4.7E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00012
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	3.5E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.017
	(Total)													0.019
													Total Hazard Index Across All Exposure Routes/Pathways:	6.5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.12.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	1.1E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0037
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	1.2E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0012
	Chromium	156	mg/kg	--	156	mg/kg	M	2.0E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.0066
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	1.6E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.55
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	1.6E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00016
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	6.1E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.0076
	Vanadium	69	mg/kg	--	69	mg/kg	M	8.8E-6	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.00098
	Zinc	3540	mg/kg	--	3540	mg/kg	M	4.5E-4	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.0015
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	--	0.73	mg/kg	M	9.3E-8	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0046
	(Total)													0.57
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	3.8E-08	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00013
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	1.3E-9	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000026
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	0.14	0.73	mg/kg	M	1.5E-8	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.00074
	(Total)													0.00090
													Total Hazard Index Across All Exposure Routes/Pathways:	0.57

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 7.13.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	1.6E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0053
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	1.7E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0017
	Chromium	156	mg/kg	--	156	mg/kg	M	2.8E-5	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.0094
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	2.3E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.78
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	2.3E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00023
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	8.7E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.011
	Vanadium	69.4	mg/kg	--	69.4	mg/kg	M	1.3E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0014
	Zinc	3540	mg/kg	--	3540	mg/kg	M	6.4E-4	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.0021
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	--	0.73	mg/kg	M	1.3E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0066
	(Total)													0.82
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00051
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	5.3E-9	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.00011
	Organic Analytes													
	PAHs													
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	--	--	ND	--	--	--	--
	PCBs as Aroclor 1254	0.73	mg/kg	0.14	0.73	mg/kg	M	5.9E-8	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0030
	(Total)													0.0036
													Total Hazard Index Across All Exposure Routes/Pathways:	0.82

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.14.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	1.6E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.0040
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0042
	Barium	5115	mg/kg	--	5115	mg/kg	M	6.5E-4	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.0093
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	8.2E-7	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.00082
	Chromium	2822	mg/kg	--	2822	mg/kg	M	3.6E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.12
	Copper	277	mg/kg	--	277	mg/kg	M	3.5E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00088
	Manganese	514	mg/kg	--	514	mg/kg	M	6.5E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0014
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	2.3E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.077
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	4.1E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00041
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	6.3E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00032
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	2.8E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.00056
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	1.3E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.016
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	8.7E-6	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.00097
	Zinc	23985	mg/kg	--	23985	mg/kg	M	3.1E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.010
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	2.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	6.2E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00031
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	8.1E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00020
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	5.6E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.028
	(Total)													0.28
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	4.3E-08	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00014
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	9.3E-10	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000019
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	2.8E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00014
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	9.2E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000046
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	1.2E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000030
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	8.9E-8	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0045
	(Total)													0.0048

Total Hazard Index Across All Exposure Routes/Pathways: 0.28

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 7.15.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	2.3E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.0058
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.8E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0060
	Barium	5115	mg/kg	--	5115	mg/kg	M	9.3E-4	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.013
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	1.2E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0012
	Chromium	2822	mg/kg	--	2822	mg/kg	M	5.1E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.17
	Copper	277	mg/kg	--	277	mg/kg	M	5.0E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0013
	Manganese	514	mg/kg	--	514	mg/kg	M	9.3E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0020
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	3.3E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.11
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	5.9E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00059
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	9.1E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00045
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	4.0E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.00080
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	1.8E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.023
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	1.2E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0014
	Zinc	23985	mg/kg	--	23985	mg/kg	M	4.4E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.015
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	3.5E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0017
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	8.9E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00045
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	1.2E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00029
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	8.0E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.040
	(Total)													0.39
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00058
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	3.7E-9	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000075
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00056
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	3.7E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00019
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	4.8E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00012
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	3.6E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.018
	(Total)													0.019
Note:													Total Hazard Index Across All Exposure Routes/Pathways:	0.41

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.16.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	1.6E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.0040
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0042
	Barium	5115	mg/kg	--	5115	mg/kg	M	6.5E-4	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.0093
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	8.2E-7	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.00082
	Chromium	2822	mg/kg	--	2822	mg/kg	M	3.6E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.12
	Copper	277	mg/kg	--	277	mg/kg	M	3.5E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00088
	Manganese	514	mg/kg	--	514	mg/kg	M	6.5E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0014
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	5.1E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	1.7
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	4.1E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00041
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	6.3E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00032
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	2.8E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.00056
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	1.3E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.016
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	8.7E-6	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.00097
	Zinc	23985	mg/kg	--	23985	mg/kg	M	3.1E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.010
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	2.4E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	6.2E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00031
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	8.1E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00020
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	5.6E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.028
	(Total)													1.9
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	4.3E-08	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00014
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	9.3E-10	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000019
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	2.8E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00014
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	9.2E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000046
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	1.2E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000030
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	8.9E-8	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.0045
	(Total)													0.0048
													Total Hazard Index Across All Exposure Routes/Pathways:	1.9

Note:
-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 7.17.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	2.3E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.0058
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.8E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0060
	Barium	5115	mg/kg	--	5115	mg/kg	M	9.3E-4	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.013
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	1.2E-6	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.0012
	Chromium	2822	mg/kg	--	2822	mg/kg	M	5.1E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.17
	Copper	277	mg/kg	--	277	mg/kg	M	5.0E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0013
	Manganese	514	mg/kg	--	514	mg/kg	M	9.3E-5	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0020
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	7.3E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	2.4
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	5.9E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00059
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	9.1E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00045
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	4.0E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.00080
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	1.8E-6	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.023
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	1.2E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0014
	Zinc	23985	mg/kg	--	23985	mg/kg	M	4.4E-3	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.015
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	3.5E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0017
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	--	49	mg/kg	M	8.9E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00045
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	1.2E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00029
	PCBs as Aroclor 1254	4.4	mg/kg	--	4.4	mg/kg	M	8.0E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.040
	(Total)													2.7
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00058
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	3.7E-9	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000075
	Organic Analytes													
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.1E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00056
	PAHs													
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	3.7E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00019
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	4.8E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00012
	PCBs as Aroclor 1254	4.4	mg/kg	0.14	4.4	mg/kg	M	3.6E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.018
	(Total)													0.019
													Total Hazard Index Across All Exposure Routes/Pathways:	2.8

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 7.18.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Antimony	11.4	mg/kg	--	11.4	mg/kg	M	1.1E-6	mg/kg-day	4.0E-04	mg/kg-day	--	--	0.0028
	Arsenic	18.6	mg/kg	--	18.6	mg/kg	M	1.8E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0061
	Barium	1855	mg/kg	--	1855	mg/kg	M	1.8E-4	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.0026
	Cadmium	7.5	mg/kg	--	7.5	mg/kg	M	7.3E-7	mg/kg-day	1.0E-03	mg/kg-day	--	--	0.00073
	Chromium	1488	mg/kg	--	1488	mg/kg	M	1.5E-4	mg/kg-day	3.0E-03	mg/kg-day	--	--	0.049
	Copper	1521	mg/kg	--	1521	mg/kg	M	1.5E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0037
	Manganese	3655	mg/kg	--	3655	mg/kg	M	3.6E-4	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.0077
	Mercury (total)	732	mg/kg	--	732	mg/kg	M	7.2E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.24
	Methylmercury	0.0074	mg/kg	--	0.0074	mg/kg	M	7.3E-10	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0000073
	Nickel	80.6	mg/kg	--	80.6	mg/kg	M	7.9E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00039
	Selenium	7.4	mg/kg	--	7.4	mg/kg	M	7.3E-7	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.00015
	Silver	24.4	mg/kg	--	24.4	mg/kg	M	2.4E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.00048
	Thallium	4.2	mg/kg	--	4.2	mg/kg	M	4.1E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.0051
	Vanadium	271	mg/kg	--	271	mg/kg	M	2.7E-5	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.0029
	Zinc	7451	mg/kg	--	7451	mg/kg	M	7.3E-4	mg/kg-day	3.0E-01	mg/kg-day	--	--	0.0024
	Organic Analytes													
	Carbazole	3.7	mg/kg	--	3.7	mg/kg	M	--	--	ND	--	--	--	--
	Dibenzofuran	4.5	mg/kg	--	4.5	mg/kg	M	4.4E-7	mg/kg-day	2.0E-03	mg/kg-day	--	--	0.00022
	Toluene	19	mg/kg	--	19	mg/kg	M	1.9E-6	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0000093
	Xylenes	31	mg/kg	--	31	mg/kg	M	3.0E-6	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.000015
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	2.3E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000058
	Benz[a]anthracene	18	mg/kg	--	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	15	mg/kg	--	15	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	18	mg/kg	--	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[ghi]perylene	2.9	mg/kg	--	2.9	mg/kg	M	2.9E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000014
	Benzo[k]fluoranthene	2.5	mg/kg	--	2.5	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.26	mg/kg	--	0.26	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	--	3.1	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	6.0	mg/kg	--	6.0	mg/kg	M	5.8E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000029
	PCBs (as Aroclor 1254)	4.4	mg/kg	--	4.4	mg/kg	M	4.3E-7	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.022
	(Total)													0.34

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 7.18.Central Tendency (continued)
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	**Metals and Organometallic Analytes**													
Absorption	Arsenic	18.6	mg/kg	0.03	18.6	mg/kg	M	1.8E-07	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00060
	Cadmium	7.5	mg/kg	0.001	7.5	mg/kg	M	2.4E-09	mg/kg-day	5.0E-05	mg/kg-day	--	--	0.000048
	Organic Analytes													
	Carbazole	3.7	mg/kg	0.10	3.7	mg/kg	M	--	--	ND	--	--	--	--
	Dibenzofuran	4.5	mg/kg	0.10	4.5	mg/kg	M	1.5E-07	mg/kg-day	2.0E-03	mg/kg-day	--	--	0.000073
	PAHs													
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	1.0E-07	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000025
	Benz[a]anthracene	18	mg/kg	0.13	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[a]pyrene	15	mg/kg	0.13	15	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[b]fluoranthene	18	mg/kg	0.13	18	mg/kg	M	--	--	ND	--	--	--	--
	Benzo[ghi]perylene	2.9	mg/kg	0.13	2.9	mg/kg	M	1.2E-07	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0000062
	Benzo[k]fluoranthene	2.5	mg/kg	0.13	2.5	mg/kg	M	--	--	ND	--	--	--	--
	Dibenz[a,h]anthracene	0.26	mg/kg	0.13	0.26	mg/kg	M	--	--	ND	--	--	--	--
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	0.13	3.1	mg/kg	M	--	--	ND	--	--	--	--
	Naphthalene	6.0	mg/kg	0.13	6.0	mg/kg	M	2.5E-07	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000013
	PCBs (as Aroclor 1254)	4.4	mg/kg	0.14	4.4	mg/kg	M	2.0E-07	mg/kg-day	2.0E-05	mg/kg-day	--	--	0.010
	(Total)													0.011
													Total Hazard Index Across All Exposure Routes/Pathways:	0.35

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - No reference dose established by EPA.
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 7.19.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	--	0.41	mg/L	M	6.3E-6	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.00014
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	2.7E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.00090
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	4.2E-11	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00000042
	(Total)													0.0010
Dermal Absorption	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	3.0E-6	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.0016
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	1.3E-7	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.0061
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	2.0E-11	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00000020
	(Total)													0.0077
													Total Hazard Index Across All Exposure Routes/Pathways:	0.0087

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser
Receptor Age: Adolescent/Pre-Adolescent

Table 7.20.Central Tendency
Calculation of Noncancer Hazards
Adult Surface Water Exposure: Central Tendency Recreational Scenario
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	--	0.41	mg/L	M	9.0E-6	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.00019
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	3.8E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0013
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	6.0E-11	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00000060
	(Total)													0.0015
Dermal Absorption	**Metals and Organometallic Analytes**													
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	3.0E-6	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.0016
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	1.3E-7	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.0061
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	2.0E-11	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00000020
	(Total)													0.0077
													Total Hazard Index Across All Exposure Routes/Pathways:	0.0092

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.21.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	2.8E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.094
	Barium	0.42	mg/L	--	0.42	mg/L	M	1.3E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.018
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	8.4E-6	mg/kg-day	5.0E-04	mg/kg-day	--	--	0.017
	Copper	0.096	mg/L	--	0.096	mg/L	M	2.9E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0072
	Manganese	1.9	mg/L	--	1.9	mg/L	M	5.8E-3	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.12
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	5.7E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.19
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	3.2E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00032
	Nickel	0.042	mg/L	--	0.042	mg/L	M	1.3E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0063
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	1.7E-5	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.21
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	1.4E-4	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.016
	Organic Analytes													
	Benzene	0.060	mg/L	--	0.060	mg/L	M	1.8E-4	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.045
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	2.9E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0015
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	2.6E-5	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000065
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	6.8E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0034
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	1.2E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.00040
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	8.5E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.017
	Toluene	0.71	mg/L	--	0.71	mg/L	M	2.1E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.011
	Xylene	0.16	mg/L	--	0.16	mg/L	M	4.9E-4	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0025
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	3.0E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.00075
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	1.3E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0067
	(Total)													0.77

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 7.21.Central Tendency (continued)
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	**Metals and Organometallic Analytes**													
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	2.1E-9	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0000071
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	9.5E-8	mg/kg-day	4.9E-03	mg/kg-day	--	--	0.000019
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	6.4E-10	mg/kg-day	1.3E-05	mg/kg-day	--	--	0.000051
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	2.2E-8	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00000054
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	4.4E-7	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.00023
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	4.3E-9	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.00021
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	2.4E-12	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.000000024
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	9.5E-10	mg/kg-day	8.0E-04	mg/kg-day	--	--	0.0000012
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	1.3E-9	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.000016
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	1.1E-8	mg/kg-day	2.3E-04	mg/kg-day	--	--	0.000045
	Organic Analytes													
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	2.9E-7	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.000071
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	9.1E-8	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0000046
	Chloroethane	0.0087	mg/L	0.0080	0.0087	mg/L	M	1.6E-8	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000000039
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	6.7E-9	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00000034
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	5.6E-8	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0000019
	4-Methylphenol	0.028	mg/L	0.004	0.028	mg/L	M	2.8E-8	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0000055
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	7.2E-6	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.000036
	Xylene	0.16	mg/L	0.080	0.16	mg/L	M	3.0E-6	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.000015
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	1.6E-8	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0000039
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	6.9E-7	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000035
	(Total)													0.00075
													Total Hazard Index Across All Exposure Routes/Pathways:	0.77

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 7.22.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	1.8E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.60
	Barium	0.42	mg/L	--	0.42	mg/L	M	8.1E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.12
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	5.4E-5	mg/kg-day	5.0E-04	mg/kg-day	--	--	0.11
	Copper	0.096	mg/L	--	0.096	mg/L	M	1.8E-3	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.046
	Manganese	1.9	mg/L	--	1.9	mg/L	M	3.7E-2	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.79
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	3.7E-4	mg/kg-day	3.0E-04	mg/kg-day	--	--	1.2
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	2.0E-7	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0020
	Nickel	0.042	mg/L	--	0.042	mg/L	M	8.0E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.040
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	1.1E-4	mg/kg-day	8.0E-05	mg/kg-day	--	--	1.4
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	9.0E-4	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.10
	Organic Analytes													
	Benzene	0.060	mg/L	--	0.060	mg/L	M	1.1E-3	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.29
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	1.9E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0094
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	1.7E-4	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.00042
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	4.4E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.022
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	7.7E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0026
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	5.4E-4	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.11
	Toluene	0.71	mg/L	--	0.71	mg/L	M	1.4E-2	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.068
	Xylene	0.16	mg/L	--	0.16	mg/L	M	3.2E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.016
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	1.9E-5	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0048
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	8.5E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.043
	(Total)													4.9

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 7.22.Central Tendency (Continued)
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal	**Metals and Organometallic Analytes**													
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	5.8E-7	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0019
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	2.6E-5	mg/kg-day	4.9E-03	mg/kg-day	--	--	0.0053
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	1.7E-7	mg/kg-day	1.3E-05	mg/kg-day	--	--	0.014
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	5.9E-6	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00015
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	1.2E-4	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.063
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	1.2E-6	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.056
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	6.5E-10	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.0000065
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	2.6E-7	mg/kg-day	8.0E-04	mg/kg-day	--	--	0.00032
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	3.5E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.0044
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	2.9E-6	mg/kg-day	2.3E-04	mg/kg-day	--	--	0.012
	Organic Analytes													
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	7.8E-5	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.019
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	2.5E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0012
	Chloroethane	0.0087	mg/L	0.0080	0.0087	mg/L	M	4.3E-6	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000011
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	1.8E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.000091
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	1.5E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.00051
	4-Methylphenol	0.028	mg/L	0.004	0.028	mg/L	M	7.5E-6	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0015
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	2.0E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0099
	Xylene	0.16	mg/L	0.080	0.16	mg/L	M	8.1E-4	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0041
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	4.3E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0011
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	1.9E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0094
	(Total)													0.20
													Total Hazard Index Across All Exposure Routes/Pathways:	5.1

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Adult

Table 7.23.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	0.075	mg/m^3	--	0.075	mg/m^3	M	7.8E-4	mg/m^3	3.0E-02	mg/m^3	--	--	0.026
	Chlorobenzene	0.012	mg/m^3	--	0.012	mg/m^3	M	1.3E-4	mg/m^3	6.0E-02	mg/m^3	--	--	0.0021
	Chloroethane	0.011	mg/m^3	--	0.011	mg/m^3	M	1.1E-4	mg/m^3	1.0E+01	mg/m^3	--	--	0.000011
	1,4-Dichlorobenzene	0.0050	mg/m^3	--	0.0050	mg/m^3	M	5.2E-5	mg/m^3	8.0E-01	mg/m^3	--	--	0.000065
	1,2-Dichloroethene, isomers	0.028	mg/m^3	--	0.028	mg/m^3	M	3.0E-4	mg/m^3	7.0E-02	mg/m^3	--	--	0.0042
	4-Methylphenol	0.035	mg/m^3	--	0.035	mg/m^3	M	3.7E-4	mg/m^3	1.8E-02	mg/m^3	--	--	0.021
	Toluene	0.89	mg/m^3	--	0.89	mg/m^3	M	9.3E-3	mg/m^3	4.0E-01	mg/m^3	--	--	0.023
	Xylenes	0.21	mg/m^3	--	0.21	mg/m^3	M	2.1E-3	mg/m^3	1.0E-01	mg/m^3	--	--	0.021
	PAHs													
	Naphthalene	0.055	mg/m^3	--	0.055	mg/m^3	M	5.8E-4	mg/m^3	3.0E-03	mg/m^3	--	--	0.19
	(Total)													0.29
													Total Hazard Index Across All Exposure Routes/Pathways:	0.29

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.

[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 7.24.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	3.8E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.13
	Barium	0.42	mg/L	--	0.42	mg/L	M	1.7E-3	mg/kg-day	7.0E-02	mg/kg-day	--	--	0.024
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	1.1E-5	mg/kg-day	5.0E-04	mg/kg-day	--	--	0.023
	Copper	0.096	mg/L	--	0.096	mg/L	M	3.9E-4	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.0098
	Manganese	1.9	mg/L	--	1.9	mg/L	M	7.8E-3	mg/kg-day	4.7E-02	mg/kg-day	--	--	0.17
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	7.7E-5	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.26
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	4.3E-8	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.00043
	Nickel	0.042	mg/L	--	0.042	mg/L	M	1.7E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0085
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	2.3E-5	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.29
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	1.9E-4	mg/kg-day	9.0E-03	mg/kg-day	--	--	0.021
	Organic Analytes													
	Benzene	0.060	mg/L	--	0.060	mg/L	M	2.4E-4	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.061
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	4.0E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0020
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	3.5E-5	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000088
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	9.2E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0046
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	1.6E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.00054
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	1.2E-4	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.023
	Toluene	0.71	mg/L	--	0.71	mg/L	M	2.9E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.014
	Xylene	0.16	mg/L	--	0.16	mg/L	M	6.7E-4	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0033
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	4.1E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0010
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	1.8E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0090
	(Total)													1.0

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 7.24.Central Tendency (Continued)
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[c]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	**Metals and Organometallic Analytes**													
	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	1.3E-6	mg/kg-day	3.0E-04	mg/kg-day	--	--	0.0044
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	5.9E-5	mg/kg-day	4.9E-03	mg/kg-day	--	--	0.012
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	3.9E-7	mg/kg-day	1.3E-05	mg/kg-day	--	--	0.031
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	1.3E-5	mg/kg-day	4.0E-02	mg/kg-day	--	--	0.00033
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	2.7E-4	mg/kg-day	1.9E-03	mg/kg-day	--	--	0.14
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	2.7E-6	mg/kg-day	2.1E-05	mg/kg-day	--	--	0.13
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	1.5E-9	mg/kg-day	1.0E-04	mg/kg-day	--	--	0.000015
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	5.8E-7	mg/kg-day	8.0E-04	mg/kg-day	--	--	0.00073
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	7.9E-7	mg/kg-day	8.0E-05	mg/kg-day	--	--	0.0099
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	6.5E-6	mg/kg-day	2.3E-04	mg/kg-day	--	--	0.028
	Organic Analytes													
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	1.8E-4	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.044
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	5.6E-5	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.0028
	Chloroethane	0.0087	mg/L	0.0080	0.0087	mg/L	M	9.7E-6	mg/kg-day	4.0E-01	mg/kg-day	--	--	0.000024
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	4.1E-6	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.00021
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	3.5E-5	mg/kg-day	3.0E-02	mg/kg-day	--	--	0.0012
	4-Methylphenol	0.028	mg/L	0.004	0.028	mg/L	M	1.7E-5	mg/kg-day	5.0E-03	mg/kg-day	--	--	0.0034
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	4.5E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.022
	Xylene	0.16	mg/L	0.080	0.16	mg/L	M	1.8E-3	mg/kg-day	2.0E-01	mg/kg-day	--	--	0.0092
	PAHs													
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	9.6E-6	mg/kg-day	4.0E-03	mg/kg-day	--	--	0.0024
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	4.3E-4	mg/kg-day	2.0E-02	mg/kg-day	--	--	0.021
	(Total)													0.46
													Total Hazard Index Across All Exposure Routes/Pathways:	1.5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Child

Table 7.25.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Non-cancer)	Intake (Noncancer) Units	Reference Dose[b]	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	**Organic Analytes**													
	Benzene	0.10	mg/m^3	--	0.10	mg/m^3	M	1.4E-3	mg/m^3	3.0E-02	mg/m^3	--	--	0.047
	Chlorobenzene	0.017	mg/m^3	--	0.017	mg/m^3	M	2.3E-4	mg/m^3	6.0E-02	mg/m^3	--	--	0.0039
	Chloroethane	0.015	mg/m^3	--	0.015	mg/m^3	M	2.1E-4	mg/m^3	1.0E+01	mg/m^3	--	--	0.000021
	1,4-Dichlorobenzene	0.0069	mg/m^3	--	0.0069	mg/m^3	M	9.5E-5	mg/m^3	8.0E-01	mg/m^3	--	--	0.00012
	1,2-Dichloroethene, isomers	0.039	mg/m^3	--	0.039	mg/m^3	M	5.4E-4	mg/m^3	7.0E-02	mg/m^3	--	--	0.0077
	4-Methylphenol	0.049	mg/m^3	--	0.049	mg/m^3	M	6.7E-4	mg/m^3	1.8E-02	mg/m^3	--	--	0.038
	Toluene	1.2	mg/m^3	--	1.2	mg/m^3	M	1.7E-2	mg/m^3	4.0E-01	mg/m^3	--	--	0.042
	Xylenes	0.28	mg/m^3	--	0.28	mg/m^3	M	3.9E-3	mg/m^3	1.0E-01	mg/m^3	--	--	0.039
	PAHs													
	Naphthalene	0.076	mg/m^3	--	0.076	mg/m^3	M	1.1E-3	mg/m^3	3.0E-03	mg/m^3	--	--	0.35
	(Total)													0.53
													Total Hazard Index Across All Exposure Routes/Pathways:	0.53

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Air
Exposure Medium: Air
Exposure Point: Outdoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.1.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Metals and Organometallic Analytes**											
	Mercury vapor	2.3E-5	mg/m^3	--	2.3E-5	mg/m^3	M	--	--	ND	--	--
	Chromium particulates[c]	2.1E-6	mg/m^3	--	2.1E-6	mg/m^3	M	4.9E-8	mg/kg-day	4.2E+1	$(mg/kg\text{-}day)^{-1}$	2E-6
											Total Risk:	2E-6
											Total Risk Across all Exposure Pathways:	2E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.

[b]Represents inhalation reference dose for mercury vapor obtained from the inhalation RfC from EPA Integrated Risk Information System (IRIS) (EPA 2005b).

[c]Calculated through application of the EPA 2005a particulate emissions factor and EPA 2005b toxicity values for particulate chromium. UCL for surface soil data in the undeveloped area (See text).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.2.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	8.9E-4	mg/kg-day	2.7E-2	$(mg/kg\text{-}day)^{-1}$	2E-5
											Total Risk:	2E-5
											Total Risk Across all Exposure Pathways:	2E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.

[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.3.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	6.1E-4	mg/m^3	--	6.1E-4	mg/m^3	M	4.3E-5	mg/kg-day	2.7E-2	$(mg/kg\text{-}day)^{-1}$	1E-6
	Chlorobenzene	5.6E-5	mg/m^3	--	5.6E-5	mg/m^3	M	--	--	ND	--	--
	Chloroethane	4.6E-4	mg/m^3	--	4.6E-4	mg/m^3	M	3.2E-5	mg/kg-day	2.9E-3	$(mg/kg\text{-}day)^{-1}$	9E-8
	1,4-Dichlorobenzene	1.4E-5	mg/m^3	--	1.4E-5	mg/m^3	M	9.8E-7	mg/kg-day	2.2E-2	$(mg/kg\text{-}day)^{-1}$	2E-8
	1,2-Dichloroethene, isomers	2.6E-4	mg/m^3	--	2.6E-4	mg/m^3	M	--	--	ND	--	--
	Toluene	7.6E-3	mg/m^3	--	7.6E-3	mg/m^3	M	--	--	ND	--	--
	Xylenes	1.5E-3	mg/m^3	--	1.5E-3	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	6.5E-5	mg/m^3	--	6.5E-5	mg/m^3	M	--	--	ND	--	--
											Total Risk:	1E-6
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.4.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Carbazole	6.6E-8	mg/m^3	--	6.6E-8	mg/m^3	M	4.6E-9	mg/kg-day	2.0E-2	$(mg/kg\text{-}day)^{-1}$	9E-11
	Dibenzofuran	3.1E-10	mg/m^3	--	3.1E-10	mg/m^3	M	--	--	ND	--	--
	Toluene	6.8E-2	mg/m^3	--	6.8E-2	mg/m^3	M	--	--	ND	--	--
	Xylenes	1.1E-1	mg/m^3	--	1.1E-1	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Benz[a]anthracene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	1.6E-7	mg/kg-day	7.3E-1	$(mg/kg\text{-}day)^{-1}$	1E-7
	Benzo[a]pyrene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	1.6E-7	mg/kg-day	7.3E+0	$(mg/kg\text{-}day)^{-1}$	1E-6
	Benzo[b]fluoranthene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	1.6E-7	mg/kg-day	7.3E-1	$(mg/kg\text{-}day)^{-1}$	1E-7
	Benzo[ghi]perylene	1.8E-6	mg/m^3	--	1.8E-6	mg/m^3	M	--	--	ND	--	--
	Benzo[k]fluoranthene	1.6E-6	mg/m^3	--	1.6E-6	mg/m^3	M	1.1E-7	mg/kg-day	7.3E-2	$(mg/kg\text{-}day)^{-1}$	8E-9
	Dibenz[a,h]anthracene	1.7E-7	mg/m^3	--	1.7E-7	mg/m^3	M	1.2E-8	mg/kg-day	7.3E+0	$(mg/kg\text{-}day)^{-1}$	8E-8
	Indeno[1,2,3-cd]pyrene	1.9E-6	mg/m^3	--	1.9E-6	mg/m^3	M	1.3E-7	mg/kg-day	7.3E-1	$(mg/kg\text{-}day)^{-1}$	1E-7
	Naphthalene	2.1E-2	mg/m^3	--	2.1E-2	mg/m^3	M	--	--	ND	--	--
											Total Risk:	2E-6
											Total Risk Across all Exposure Pathways:	2E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.5.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	1.0E-3	mg/m^3	--	1.0E-3	mg/m^3	M	7.2E-5	mg/kg-day	2.7E-2	$(mg/kg\text{-}day)^{-1}$	2E-6
	Chlorobenzene	9.4E-5	mg/m^3	--	9.4E-5	mg/m^3	M	--	--	ND	--	--
	Chloroethane	7.5E-4	mg/m^3	--	7.5E-4	mg/m^3	M	5.2E-5	mg/kg-day	2.9E-3	$(mg/kg\text{-}day)^{-1}$	2E-7
	1,4-Dichlorobenzene	2.4E-5	mg/m^3	--	2.4E-5	mg/m^3	M	1.7E-6	mg/kg-day	2.2E-2	$(mg/kg\text{-}day)^{-1}$	4E-8
	1,2-Dichloroethene, isomers	4.3E-4	mg/m^3	--	4.3E-4	mg/m^3	M	--	--	ND	--	--
	Toluene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	--	--	ND	--	--
	Xylenes	2.5E-3	mg/m^3	--	2.5E-3	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	1.1E-4	mg/m^3	--	1.1E-4	mg/m^3	M	--	--	ND	--	--
											Total Risk:	2E-6
											Total Risk Across all Exposure Pathways:	2E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (unpaved)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.6.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	11.0	mg/kg	--	11.0	mg/kg	M	1.9E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-6
	Chromium	96.9	mg/kg	--	96.9	mg/kg	M	--	--	ND	--	--
	Copper	470	mg/kg	--	470	mg/kg	M	--	--	ND	--	--
	Manganese	540	mg/kg	--	540	mg/kg	M	--	--	ND	--	--
	Mercury (total)	310	mg/kg	--	310	mg/kg	M	--	--	ND	--	--
	Vanadium	140	mg/kg	--	140	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benzo[a]pyrene	0.41	mg/kg	--	0.41	mg/kg	M	7.2E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-7
	Benzo[b]fluoranthene	0.75	mg/kg	--	0.75	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Dibenz[a,h]anthracene	0.071	mg/kg	--	0.071	mg/kg	M	1.2E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	9E-8
	(Total)										Total Risk:	4E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	11.0	mg/kg	0.03	11.0	mg/kg	M	7.6E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Organic Analytes											
	PAHs											
	Benzo[a]pyrene	0.41	mg/kg	0.13	0.41	mg/kg	M	1.2E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	9E-7
	Benzo[b]fluoranthene	0.75	mg/kg	0.13	0.75	mg/kg	M	2.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Dibenz[a,h]anthracene	0.071	mg/kg	0.13	0.071	mg/kg	M	2.1E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)										Total Risk:	2E-6
											Total Risk Across all Exposure Pathways:	6E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.7 RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Commercial Worker Surface Soil Ingestion/Dermal Absorption

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	1.1E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-6
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	--	--	ND	--	--
	Copper	6274	mg/kg	--	6274	mg/kg	M	--	--	ND	--	--
	Manganese	343	mg/kg	--	343	mg/kg	M	--	--	ND	--	--
	Mercury (total)	1312	mg/kg	--	1312	mg/kg	M	--	--	ND	--	--
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--
	Vanadium	140	mg/kg	--	140	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	4.9E-7	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	3E-8
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	1.0E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	7E-7
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	9E-8
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	2.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)											3E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	4.3E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	6E-7
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	2.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	1.7E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	2.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	4.5E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-7
	(Total)											3E-6
											Total Risk Across all Exposure Pathways:	5E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.8.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Commercial Worker Surface Soil Ingestion/Dermal Absorption

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	1.1E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-6
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	--	--	ND	--	--
	Copper	6274	mg/kg	--	6274	mg/kg	M	--	--	ND	--	--
	Manganese	343	mg/kg	--	343	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	3861	mg/kg	--	3861	mg/kg	M	--	--	ND	--	--
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--
	Vanadium	140	mg/kg	--	140	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	4.9E-7	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	3E-8
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	1.0E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	7E-7
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	9E-8
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	2.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)											3E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	4.3E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	6E-7
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	2.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	1.7E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	2.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	4.5E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-7
	(Total)											3E-6
											Total Risk Across all Exposure Pathways:	5E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Developed Area Subsurface Soil (1-20 ft)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 8.9.RME
Calculation of Noncancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Construction Worker Subsurface Soil Ingestion/Dermal Absorption

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	2.2E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-7
	Barium	818	mg/kg	--	818	mg/kg	M	--	--	ND	--	--
	Chromium	131	mg/kg	--	131	mg/kg	M	--	--	ND	--	--
	Copper	7420	mg/kg	--	7420	mg/kg	M	--	--	ND	--	--
	Manganese	812	mg/kg	--	812	mg/kg	M	--	--	ND	--	--
	Mercury (total)	2908	mg/kg	--	2908	mg/kg	M	--	--	ND	--	--
	Thallium	5.4	mg/kg	--	5.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	6.2E-8	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	3E-9
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	0.36	mg/kg	--	0.36	mg/kg	M	8.0E-9	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-8
	(Total)											3E-7
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.3E-08	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-8
	Organic Analytes											
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	0.36	mg/kg	0.14	0.36	mg/kg	M	2.2E-09	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	4E-9
	(Total)											2E-8
											Total Risk Across all Exposure Pathways:	4E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.10.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.7E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-6
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	3.4E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	5E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	4.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	4.9E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	5.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	1.6E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	3.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	7.7E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-6
	(Total)											1E-5
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	6.9E-07	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.1	192	mg/kg	M	4.4E-05	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	6E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	7.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-7
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	8.5E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-6
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	9.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	7E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	2.7E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.72	mg/kg	M	5.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	1.4E-6	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	3E-6
	(Total)											1E-5
											Total Risk Across all Exposure Pathways:	2E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PCBs - Polychlorinated biphenyls

UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.11.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.7E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-6
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	3.4E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	5E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	4.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	4.9E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	5.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	1.6E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	3.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	7.7E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-6
	(Total)											1E-5
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	6.9E-07	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.1	192	mg/kg	M	4.4E-05	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	6E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	7.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-7
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	8.5E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-6
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	9.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	7E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	2.7E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.72	mg/kg	M	5.2E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	1.4E-6	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	3E-6
	(Total)											1E-5
											Total Risk Across all Exposure Pathways:	2E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.12.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	1.9E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-6
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	--	--	ND	--	--
	Chromium	156	mg/kg	--	156	mg/kg	M	--	--	ND	--	--
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	--	--	ND	--	--
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	--	--	ND	--	--
	Vanadium	69.4	mg/kg	--	69.4	mg/kg	M	--	--	ND	--	--
	Zinc	3540	mg/kg	--	3540	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	3.8E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	3.5E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-6
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	4.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	7.1E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-7
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	2.7E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	PCBs (Total)	0.73	mg/kg	--	0.73	mg/kg	M	1.6E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	3E-7
	(Total)											7E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	1.0E-06	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	8.4E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	6E-7
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	7.9E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-6
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	8.9E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	6E-7
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	1.6E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	5.9E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	PCBs (Total)	0.73	mg/kg	0.14	0.73	mg/kg	M	3.9E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	8E-7
	(Total)											1E-5
											Total Risk Across all Exposure Pathways:	2E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.13.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	8.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	--	--	ND	--	--
	Chromium	156	mg/kg	--	156	mg/kg	M	--	--	ND	--	--
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.126	mg/kg	--	0.126	mg/kg	M	--	--	ND	--	--
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	--	--	ND	--	--
	Vanadium	69.4	mg/kg	--	69.4	mg/kg	M	--	--	ND	--	--
	Zinc	3540	mg/kg	--	3540	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	1.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	1.5E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	1.7E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	3.0E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	1.1E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	8E-8
	PCBs (Total)	0.73	mg/kg	--	0.73	mg/kg	M	6.9E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-7
	(Total)											3E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	3.0E-07	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-7
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	2.5E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	2.4E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-6
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	2.7E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	4.7E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-7
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	1.8E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	PCBs (Total)	0.73	mg/kg	0.14	0.73	mg/kg	M	1.2E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)											3E-6
											Total Risk Across all Exposure Pathways:	6E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.14.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	2.2E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-6
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	4.2E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	6E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	5.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	6.3E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	7.1E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	2.0E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	3.8E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	9.7E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-6
	(Total)											1E-5
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.1E-06	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-6
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	7.3E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	1E-6
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	1.2E-6	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	9E-7
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	1.4E-6	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-5
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	1.6E-6	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-6
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	4.4E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	8.5E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	6E-7
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.1	4.4	mg/kg	M	2.3E-06	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	5E-6
	(Total)											2E-5
											Total Risk Across all Exposure Pathways:	4E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.15.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	9.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	1.8E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	3E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	2.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	2.7E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	3.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	8.5E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	1.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Naphthalene	49.0	mg/kg	--	49.0	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	4.2E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	8E-7
	(Total)											6E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	3.4E-07	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-7
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	2.2E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	3E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	3.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	4.2E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-6
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	4.7E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	1.3E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	2.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Naphthalene	49.0	mg/kg	0.13	49.0	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	7.0E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-6
	(Total)											7E-6
											Total Risk Across all Exposure Pathways:	1E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.16.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	2.2E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-6
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	4.2E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	6E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	5.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	6.3E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	7.1E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	2.0E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	3.8E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	9.7E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-6
	(Total)											1E-5
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	1.1E-06	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-6
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	7.3E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	1E-6
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	1.2E-6	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	9E-7
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	1.4E-6	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-5
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	1.6E-6	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-6
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	4.4E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	8.5E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	6E-7
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.1	4.4	mg/kg	M	2.3E-06	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	5E-6
	(Total)											2E-5
											Total Risk Across all Exposure Pathways:	4E-5

Note:
-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.1)
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.17.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	9.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-6
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	1.8E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	3E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	2.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	2.7E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	3.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	8.5E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	1.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Naphthalene	49.0	mg/kg	--	49.0	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	4.2E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	8E-7
	(Total)											6E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	3.4E-07	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-7
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	2.2E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	3E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	3.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	4.2E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-6
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	4.7E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	1.3E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	2.6E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-7
	Naphthalene	49.0	mg/kg	0.13	49.0	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	7.0E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-6
	(Total)											7E-6
											Total Risk Across all Exposure Pathways:	1E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 8.18.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	11.4	mg/kg	--	11.4	mg/kg	M	--	--	ND	--	--
	Arsenic	18.6	mg/kg	--	18.6	mg/kg	M	4.1E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	6E-7
	Barium	1855	mg/kg	--	1855	mg/kg	M	--	--	ND	--	--
	Cadmium	7.5	mg/kg	--	7.5	mg/kg	M	--	--	ND	--	--
	Chromium	1488	mg/kg	--	1488	mg/kg	M	--	--	ND	--	--
	Copper	1521	mg/kg	--	1521	mg/kg	M	--	--	ND	--	--
	Manganese	3655	mg/kg	--	3655	mg/kg	M	--	--	ND	--	--
	Mercury (total)	732	mg/kg	--	732	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.0074	mg/kg	--	0.0074	mg/kg	M	--	--	ND	--	--
	Nickel	81	mg/kg	--	81	mg/kg	M	--	--	ND	--	--
	Selenium	7.4	mg/kg	--	7.4	mg/kg	M	--	--	ND	--	--
	Silver	24	mg/kg	--	24	mg/kg	M	--	--	ND	--	--
	Thallium	4.2	mg/kg	--	4.2	mg/kg	M	--	--	ND	--	--
	Vanadium	271	mg/kg	--	271	mg/kg	M	--	--	ND	--	--
	Zinc	7451	mg/kg	--	7451	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Carbazole	3.7	mg/kg	--	3.7	mg/kg	M	8.2E-8	mg/kg-day	2.0E-2	(mg/kg-day) $^{-1}$	2E-9
	Dibenzofuran	4.5	mg/kg	--	4.5	mg/kg	M	--	--	ND	--	--
	Toluene	19	mg/kg	--	19	mg/kg	M	--	--	ND	--	--
	Xylenes	31	mg/kg	--	31	mg/kg	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--
	Benz[a]anthracene	18	mg/kg	--	18	mg/kg	M	4.1E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[a]pyrene	15	mg/kg	--	15	mg/kg	M	3.2E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-6
	Benzo[b]fluoranthene	18	mg/kg	--	18	mg/kg	M	4.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-7
	Benzo[ghi]perylene	2.9	mg/kg	--	2.9	mg/kg	M	--	--	ND	--	--
	Benzo[k]fluoranthene	2.5	mg/kg	--	2.5	mg/kg	M	5.6E-8	mg/kg-day	7.3E-2	(mg/kg-day) $^{-1}$	4E-9
	Dibenz[a,h]anthracene	0.26	mg/kg	--	0.26	mg/kg	M	5.8E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-8
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	--	3.1	mg/kg	M	6.8E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-8
	Naphthalene	6.0	mg/kg	--	6.0	mg/kg	M	--	--	ND	--	--
	PCBs (as Aroclor 1254)	4.4	mg/kg	--	4.4	mg/kg	M	9.7E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)											4E-06

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 8.18.RME (continued)
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	18.6	mg/kg	0.03	18.6	mg/kg	M	2.5E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	4E-08
	Cadmium	7.5	mg/kg	0.001	7.5	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Carbazole	3.7	mg/kg	0.10	3.7	mg/kg	M	1.6E-8	mg/kg-day	2.0E-2	(mg/kg-day) $^{-1}$	3E-10
	Dibenzofuran	4.5	mg/kg	0.10	4.5	mg/kg	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--
	Benz[a]anthracene	18	mg/kg	0.13	18	mg/kg	M	1.1E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	8E-8
	Benzo[a]pyrene	15	mg/kg	0.13	15	mg/kg	M	8.4E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-7
	Benzo[b]fluoranthene	18	mg/kg	0.13	18	mg/kg	M	1.0E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	8E-8
	Benzo[ghi]perylene	2.9	mg/kg	0.13	2.9	mg/kg	M	--	--	ND	--	--
	Benzo[k]fluoranthene	2.5	mg/kg	0.13	2.5	mg/kg	M	1.4E-8	mg/kg-day	7.3E-2	(mg/kg-day) $^{-1}$	1E-9
	Dibenz[a,h]anthracene	0.26	mg/kg	0.13	0.26	mg/kg	M	1.5E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-8
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	0.13	3.1	mg/kg	M	1.8E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Naphthalene	6.0	mg/kg	0.13	6.0	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	2.7E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	5E-8
	(Total)											9E-7
											Total Risk Across all Exposure Pathways:	5E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.19.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	--	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
Dermal	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
											Total Risk Across all Exposure Pathways:	0E+0

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.20.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	--	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
Dermal	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
											Total Risk Across all Exposure Pathways:	0E+0

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.21.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	3.3E-5	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-5
	Barium	0.42	mg/L	--	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	--	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	--	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	--	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	--	0.060	mg/L	M	2.1E-4	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	1E-5
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	3.0E-5	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	9E-8
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	1.4E-5	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	3E-7
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	--	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	--	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	--	--	ND	--	--
	(Total)											6E-5

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.21.RME (continued)
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal	**Metals and Organometallic Analytes**											
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	8.7E-10	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-9
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	1.2E-7	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	6E-9
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	0.008	0.0087	mg/L	M	6.4E-9	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	2E-11
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.004	mg/L	0.062	0.004	mg/L	M	2.3E-8	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	5E-10
	4-Methylphenol	0.028	mg/L	0.0043	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	0.08	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	--	--	ND	--	--
	(Total)											8E-9
											Total Risk Across all Exposure Pathways:	6E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 8.22.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	1.1E-4	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-4
	Barium	0.42	mg/L	--	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	--	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	--	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	--	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	--	0.060	mg/L	M	7.0E-4	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	4E-5
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	1.0E-4	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	3E-7
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	4.7E-5	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	1E-6
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	--	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	--	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	--	--	ND	--	--
	(Total)											2E-4

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 8.22 .RME (Continued)
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal	**Metals and Organometallic Analytes**											
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	5.8E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	9E-7
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.0962	mg/L	0.001	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.00001	mg/L	0.001	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	7.7E-5	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	4E-6
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	0.008	0.0087	mg/L	M	4.3E-6	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	1E-8
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	1.5E-5	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	4E-7
	4-Methylphenol	0.028	mg/L	0.0043	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	0.08	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	--	--	ND	--	--
	(Total)											5E-6
											Total Risk Across all Exposure Pathways:	2E-4

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004).
[c]Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure on the basis of absorbed doses (U.S. EPA 2004).
Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Adult

Table 8.23.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	1.8	mg/m^3	--	1.8	mg/m^3	M	1.8E-02	mg/m^3-day	7.8E-3	m^3-day/mg	1E-4
	Chlorobenzene	0.29	mg/m^3	--	0.29	mg/m^3	M	--	--	ND	--	--
	Chloroethane	0.26	mg/m^3	--	0.26	mg/m^3	M	2.7E-03	mg/m^3-day	8.3E-4	m^3-day/mg	2E-6
	1,4-Dichlorobenzene	0.12	mg/m^3	--	0.12	mg/m^3	M	1.2E-03	mg/m^3-day	6.3E-3	m^3-day/mg	8E-6
	1,2-Dichloroethene, isomers	0.021	mg/m^3	--	0.021	mg/m^3	M	--	--	ND	--	--
	4-Methylphenol	0.83	mg/m^3	--	0.83	mg/m^3	M	--	--	ND	--	--
	Toluene	21	mg/m^3	--	21	mg/m^3	M	--	--	ND	--	--
	Xylenes	4.8	mg/m^3	--	4.8	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	1.3	mg/m^3	--	1.3	mg/m^3	M	--	--	ND	--	--
											Total Risk:	2E-4
											Total Risk Across all Exposure Pathways:	2E-4

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 8.24.RME
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	7.7E-5	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-4
	Barium	0.42	mg/L	--	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	--	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	--	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	--	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	--	0.060	mg/L	M	4.9E-4	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	3E-5
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	7.2E-5	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	2E-7
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	3.3E-5	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	8E-7
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	--	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	--	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	--	--	ND	--	--
	(Total)											1E-4

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 8.24.RME (continued)
Calculation of Cancer Risks
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	3.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-7
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	4.6E-5	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	3E-6
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	0.008	0.0087	mg/L	M	2.5E-6	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	7E-9
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	9.0E-6	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	2E-7
	4-Methylphenol	0.028	mg/L	0.0043	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	0.08	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	--	--	ND	--	--
	(Total)											3E-6
											Total Risk Across all Exposure Pathways:	1E-4

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Child

Table 8.25.RME
Calculation of Cancer Hazards
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	3.1	mg/m^3	--	3.1	mg/m^3	M	1.1E-02	mg/m^3-day	7.8E-3	m^3-day/mg	9E-5
	Chlorobenzene	0.51	mg/m^3	--	0.51	mg/m^3	M	--	--	ND	--	--
	Chloroethane	0.46	mg/m^3	--	0.46	mg/m^3	M	1.6E-03	mg/m^3-day	8.3E-4	m^3-day/mg	1E-6
	1,4-Dichlorobenzene	0.21	mg/m^3	--	0.21	mg/m^3	M	7.5E-04	mg/m^3-day	6.3E-3	m^3-day/mg	5E-6
	1,2-Dichloroethene, isomers	0.02	mg/m^3	--	0.02	mg/m^3	M	--	--	ND	--	--
	4-Methylphenol	1.5	mg/m^3	--	1.5	mg/m^3	M	--	--	ND	--	--
	Toluene	37	mg/m^3	--	37	mg/m^3	M	--	--	ND	--	--
	Xylenes	8.6	mg/m^3	--	8.6	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	2.3	mg/m^3	--	2.3	mg/m^3	M	--	--	ND	--	--
											Total Risk:	9E-5
											Total Risk Across all Exposure Pathways:	9E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Air
Exposure Medium: Air
Exposure Point: Outdoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.1.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Metals and Organometallic Analytes**											
	Mercury vapor	2.3E-5	mg/m^3	--	2E-5	mg/m^3	M	--	--	ND	--	--
	Chromium particulates[c]	2.1E-6	mg/m^3	--	2E-6	mg/m^3	M	6.1E-9	mg/kg-day	4E+1	$(mg/kg\text{-}day)^{-1}$	3E-7
											Total Risk:	3E-7
											Total Risk Across all Exposure Pathways:	3E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the 95th percentile UCL on the mean or the maximum concentration.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).
[c]Calculated through application of the EPA 2005a particulate emissions factor and EPA 2005b toxicity values for particulate chromium. UCL for surface soil data in the undeveloped area (See text).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.2.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	1.3E-4	mg/kg-day	2.7E-2	$(mg/kg\text{-}day)^{-1}$	3E-6
											Total Risk:	3E-6
											Total Risk Across all Exposure Pathways:	3E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Developed Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.3.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	6.1E-4	mg/m^3	--	6.1E-4	mg/m^3	M	6.1E-6	mg/kg-day	2.7E-2	$(mg/kg\text{-}day)^{-1}$	2E-7
	Chlorobenzene	5.6E-5	mg/m^3	--	5.6E-5	mg/m^3	M	--	--	ND	--	--
	Chloroethane	4.6E-4	mg/m^3	--	4.6E-4	mg/m^3	M	4.5E-6	mg/kg-day	2.9E-3	$(mg/kg\text{-}day)^{-1}$	1E-8
	1,4-Dichlorobenzene	1.4E-5	mg/m^3	--	1.4E-5	mg/m^3	M	1.4E-7	mg/kg-day	2.2E-2	$(mg/kg\text{-}day)^{-1}$	3E-9
	1,2-Dichloroethene, isomers	2.6E-4	mg/m^3	--	2.6E-4	mg/m^3	M	--	--	ND	--	--
	Toluene	7.6E-3	mg/m^3	--	7.6E-3	mg/m^3	M	--	--	ND	--	--
	Xylenes	1.5E-3	mg/m^3	--	1.5E-3	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	6.5E-5	mg/m^3	--	6.5E-5	mg/m^3	M	--	--	ND	--	--
											Total Risk:	2E-7
											Total Risk Across all Exposure Pathways:	2E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.4.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Carbazole	6.6E-8	mg/m^3	--	6.6E-8	mg/m^3	M	6.6E-10	mg/kg-day	2.0E-2	$(mg/kg\text{-}day)^{-1}$	1E-11
	Dibenzofuran	3.1E-10	mg/m^3	--	3.1E-10	mg/m^3	M	--	--	ND	--	--
	Toluene	6.8E-2	mg/m^3	--	6.8E-2	mg/m^3	M	--	--	ND	--	--
	Xylenes	1.1E-1	mg/m^3	--	1.1E-1	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Benz[a]anthracene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	2.3E-8	mg/kg-day	7.3E-1	$(mg/kg\text{-}day)^{-1}$	2E-8
	Benzo[a]pyrene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	2.3E-8	mg/kg-day	7.3E+0	$(mg/kg\text{-}day)^{-1}$	2E-7
	Benzo[b]fluoranthene	2.3E-6	mg/m^3	--	2.3E-6	mg/m^3	M	2.3E-8	mg/kg-day	7.3E-1	$(mg/kg\text{-}day)^{-1}$	2E-8
	Benzo[ghi]perylene	1.8E-6	mg/m^3	--	1.8E-6	mg/m^3	M	--	--	ND	--	--
	Benzo[k]fluoranthene	1.6E-6	mg/m^3	--	1.6E-6	mg/m^3	M	1.6E-8	mg/kg-day	7.3E-2	$(mg/kg\text{-}day)^{-1}$	1E-9
	Dibenz[a,h]anthracene	1.7E-7	mg/m^3	--	1.7E-7	mg/m^3	M	1.6E-9	mg/kg-day	7.3E+0	$(mg/kg\text{-}day)^{-1}$	1E-8
	Indeno[1,2,3-cd]pyrene	1.9E-6	mg/m^3	--	1.9E-6	mg/m^3	M	1.9E-8	mg/kg-day	7.3E-1	$(mg/kg\text{-}day)^{-1}$	1E-8
	Naphthalene	2.1E-2	mg/m^3	--	2.1E-2	mg/m^3	M	--	--	ND	--	--
											Total Risk:	2E-7
											Total Risk Across all Exposure Pathways:	2E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Undeveloped Area Indoor Air
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.5.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	1.0E-3	mg/m^3	--	1.0E-3	mg/m^3	M	1.0E-5	mg/kg-day	2.7E-2	$(mg/kg\text{-}day)^{-1}$	3E-7
	Chlorobenzene	9.4E-5	mg/m^3	--	9.4E-5	mg/m^3	M	--	--	ND	--	--
	Chloroethane	7.5E-4	mg/m^3	--	7.5E-4	mg/m^3	M	7.4E-6	mg/kg-day	2.9E-3	$(mg/kg\text{-}day)^{-1}$	2E-8
	1,4-Dichlorobenzene	2.4E-5	mg/m^3	--	2.4E-5	mg/m^3	M	2.4E-7	mg/kg-day	2.2E-2	$(mg/kg\text{-}day)^{-1}$	5E-9
	1,2-Dichloroethene, isomers	4.3E-4	mg/m^3	--	4.3E-4	mg/m^3	M	--	--	ND	--	--
	Toluene	1.3E-2	mg/m^3	--	1.3E-2	mg/m^3	M	--	--	ND	--	--
	Xylenes	2.5E-3	mg/m^3	--	2.5E-3	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	1.1E-4	mg/m^3	--	1.1E-4	mg/m^3	M	--	--	ND	--	--
											Total Risk:	3E-7
											Total Risk Across all Exposure Pathways:	3E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Johnson and Ettinger Model and site subsurface soil data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (unpaved)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.6.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	11.0	mg/kg	--	11.0	mg/kg	M	6.1E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	9E-7
	Chromium	96.9	mg/kg	--	96.9	mg/kg	M	--	--	ND	--	--
	Copper	470	mg/kg	--	470	mg/kg	M	--	--	ND	--	--
	Manganese	540	mg/kg	--	540	mg/kg	M	--	--	ND	--	--
	Mercury (total)	310	mg/kg	--	310	mg/kg	M	--	--	ND	--	--
	Vanadium	140	mg/kg	--	140	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benzo[a]pyrene	0.41	mg/kg	--	0.41	mg/kg	M	2.3E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	0.75	mg/kg	--	0.75	mg/kg	M	4.1E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Dibenz[a,h]anthracene	0.071	mg/kg	--	0.071	mg/kg	M	3.9E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-8
	(Total)										Total Risk:	1E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	11.0	mg/kg	0.03	11.0	mg/kg	M	2.4E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	4E-8
	Organic Analytes											
	PAHs											
	Benzo[a]pyrene	0.41	mg/kg	0.13	0.41	mg/kg	M	3.9E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-8
	Benzo[b]fluoranthene	0.75	mg/kg	0.13	0.75	mg/kg	M	7.1E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-9
	Dibenz[a,h]anthracene	0.071	mg/kg	0.13	0.071	mg/kg	M	6.7E-10	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-9
	(Total)										Total Risk:	7E-8
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.7.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Commercial Worker Surface Soil Ingestion/Dermal Absorption

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	3.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-7
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	--	--	ND	--	--
	Copper	6274	mg/kg	--	6274	mg/kg	M	--	--	ND	--	--
	Manganese	343	mg/kg	--	343	mg/kg	M	--	--	ND	--	--
	Mercury (total)	1312	mg/kg	--	1312	mg/kg	M	--	--	ND	--	--
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--
	Vanadium	140	mg/kg	--	140	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	1.5E-7	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	8E-9
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	4.1E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	3.2E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	4.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	8.3E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-8
	(Total)											9E-7
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	1.4E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-8
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	7.1E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-9
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	5.4E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-8
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	6.8E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-9
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	1.4E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-8
	(Total)											8E-8
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Developed Area Surface Soil (all)
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.8.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Commercial Worker Surface Soil Ingestion/Dermal Absorption

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	--	6.2	mg/kg	M	3.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-7
	Chromium	75.6	mg/kg	--	75.6	mg/kg	M	--	--	ND	--	--
	Copper	6274	mg/kg	--	6274	mg/kg	M	--	--	ND	--	--
	Manganese	343	mg/kg	--	343	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	3861	mg/kg	--	3861	mg/kg	M	--	--	ND	--	--
	Thallium	2.8	mg/kg	--	2.8	mg/kg	M	--	--	ND	--	--
	Vanadium	140	mg/kg	--	140	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	1.5E-7	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	8E-9
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	--	0.75	mg/kg	M	4.1E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Benzo[a]pyrene	0.57	mg/kg	--	0.57	mg/kg	M	3.2E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	0.72	mg/kg	--	0.72	mg/kg	M	4.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Dibenz[a,h]anthracene	0.15	mg/kg	--	0.15	mg/kg	M	8.3E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-8
	(Total)											9E-7
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	6.2	mg/kg	0.03	6.2	mg/kg	M	1.4E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-8
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	0.75	mg/kg	0.13	0.75	mg/kg	M	7.1E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-9
	Benzo[a]pyrene	0.57	mg/kg	0.13	0.57	mg/kg	M	5.4E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-8
	Benzo[b]fluoranthene	0.72	mg/kg	0.13	0.72	mg/kg	M	6.8E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-9
	Dibenz[a,h]anthracene	0.15	mg/kg	0.13	0.15	mg/kg	M	1.4E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-8
	(Total)											8E-8
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Developed Area Subsurface Soil (1-20 ft)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 8.9.Central Tendency
Calculation of Noncancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Construction Worker Subsurface Soil Ingestion/Dermal Absorption

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.4E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-8
	Barium	818	mg/kg	--	818	mg/kg	M	--	--	ND	--	--
	Chromium	131	mg/kg	--	131	mg/kg	M	--	--	ND	--	--
	Copper	7420	mg/kg	--	7420	mg/kg	M	--	--	ND	--	--
	Manganese	812	mg/kg	--	812	mg/kg	M	--	--	ND	--	--
	Mercury (total)	2908	mg/kg	--	2908	mg/kg	M	--	--	ND	--	--
	Thallium	5.4	mg/kg	--	5.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	2.8	mg/kg	--	2.8	mg/kg	M	3.9E-9	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	2E-10
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	0.36	mg/kg	--	0.36	mg/kg	M	5.0E-10	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-9
	(Total)											2E-8
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.7E-09	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	4E-9
	Organic Analytes											
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	0.36	mg/kg	0.14	0.36	mg/kg	M	4.6E-10	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	9E-10
	(Total)											5E-9
											Total Risk Across all Exposure Pathways:	3E-8

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.10.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	5.5E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	8E-7
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	1.1E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	1E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	1.6E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	1.8E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	5.0E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	9.5E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	7E-8
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	2.4E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	5E-7
	(Total)											3E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.2E-08	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-8
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.1	192	mg/kg	M	1.4E-06	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	2E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	2.3E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	2.7E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	3.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	8.5E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-8
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	1.6E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	4.5E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	9E-8
	(Total)											4E-7
											Total Risk Across all Exposure Pathways:	4E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.11.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	5.5E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	8E-7
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	1.1E-5	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	1E-7
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	1.3E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	1.6E-7	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-6
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	1.8E-7	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-7
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	5.0E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	9.5E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	7E-8
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	2.4E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	5E-7
	(Total)											3E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.2E-08	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-8
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.1	192	mg/kg	M	1.4E-06	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	2E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	2.3E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	2.7E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	3.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	8.5E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-8
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	1.6E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	4.5E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	9E-8
	(Total)											4E-7
											Total Risk Across all Exposure Pathways:	4E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.12.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	1.4E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-7
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	--	--	ND	--	--
	Chromium	156	mg/kg	--	156	mg/kg	M	--	--	ND	--	--
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	--	--	ND	--	--
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	--	--	ND	--	--
	Vanadium	69	mg/kg	--	69	mg/kg	M	--	--	ND	--	--
	Zinc	3540	mg/kg	--	3540	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	2.8E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	2.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	2.9E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	5.2E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	4E-8
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	2.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	PCBs (Total)	0.73	mg/kg	--	0.73	mg/kg	M	1.2E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-8
	(Total)											5E-7
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	4.9E-09	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	7E-9
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	4.1E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-9
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	3.9E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-8
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	4.4E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-9
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	7.8E-10	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-9
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	2.9E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-9
	PCBs (Total)	0.73	mg/kg	0.14	0.73	mg/kg	M	1.9E-9	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	4E-9
	(Total)											5E-8
											Total Risk Across all Exposure Pathways:	6E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Undeveloped Area Surface Sediment
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.13.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	--	8.8	mg/kg	M	2.1E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-7
	Cadmium	9.1	mg/kg	--	9.1	mg/kg	M	--	--	ND	--	--
	Chromium	156	mg/kg	--	156	mg/kg	M	--	--	ND	--	--
	Mercury (total)	1290	mg/kg	--	1290	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.13	mg/kg	--	0.13	mg/kg	M	--	--	ND	--	--
	Thallium	4.8	mg/kg	--	4.8	mg/kg	M	--	--	ND	--	--
	Vanadium	69.4	mg/kg	--	69.4	mg/kg	M	--	--	ND	--	--
	Zinc	3540	mg/kg	--	3540	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	--	1.7	mg/kg	M	4.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Benzo[a]pyrene	1.6	mg/kg	--	1.6	mg/kg	M	3.7E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-7
	Benzo[b]fluoranthene	1.8	mg/kg	--	1.8	mg/kg	M	4.2E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Dibenz[a,h]anthracene	0.32	mg/kg	--	0.32	mg/kg	M	7.5E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-8
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	--	1.2	mg/kg	M	2.8E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	PCBs (Total)	0.73	mg/kg	--	0.73	mg/kg	M	1.7E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	3E-8
	(Total)											8E-7
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	8.8	mg/kg	0.03	8.8	mg/kg	M	2.0E-08	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-8
	Cadmium	9.1	mg/kg	0.001	9.1	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	PAHs											
	Benz[a]anthracene	1.7	mg/kg	0.13	1.7	mg/kg	M	1.7E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Benzo[a]pyrene	1.6	mg/kg	0.13	1.6	mg/kg	M	1.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-7
	Benzo[b]fluoranthene	1.8	mg/kg	0.13	1.8	mg/kg	M	1.7E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Dibenz[a,h]anthracene	0.32	mg/kg	0.13	0.32	mg/kg	M	3.1E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-8
	Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.13	1.2	mg/kg	M	1.2E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	9E-9
	PCBs (Total)	0.73	mg/kg	0.14	0.73	mg/kg	M	7.6E-9	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-8
	(Total)											2E-7
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.14.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.6E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-7
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	3.1E-6	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	4E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	3.9E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	4.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-7
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	5.2E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	1.5E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	2.8E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	7.2E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-7
	(Total)											1E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	5.6E-09	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	8E-9
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	3.6E-7	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	5E-9
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	5.8E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-9
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	6.8E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-8
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	7.7E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	6E-9
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	2.2E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-8
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	4.2E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-9
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.1	4.4	mg/kg	M	1.1E-08	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-8
	(Total)											1E-7
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls

UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.15.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	2.3E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-7
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total)	181	mg/kg	--	181	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	4.5E-6	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	6E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	5.6E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-8
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	6.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-7
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	7.5E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	2.1E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	4.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	1.0E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)											1E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.2E-08	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-8
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.4E-6	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	2E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	2.3E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	2.7E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	3.1E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	8.7E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-8
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	1.7E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	4.6E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	9E-8
	(Total)											5E-7
											Total Risk Across all Exposure Pathways:	2E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.16.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	1.6E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-7
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	3.1E-6	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	4E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	3.9E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	4.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-7
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	5.2E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	1.5E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	2.8E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	7.2E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-7
	(Total)											1E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	5.6E-09	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	8E-9
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	3.6E-7	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	5E-9
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	5.8E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-9
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	6.8E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-8
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	7.7E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	6E-9
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	2.2E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-8
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	4.2E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-9
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.1	4.4	mg/kg	M	1.1E-08	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-8
	(Total)											1E-7
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Undeveloped Area Surface Soil
Includes Mercury Hot Spot Analysis (fractional intake 0.05)
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.17.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	12.7	mg/kg	--	12.7	mg/kg	M	--	--	ND	--	--
	Arsenic	9.9	mg/kg	--	9.9	mg/kg	M	2.3E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-7
	Barium	5115	mg/kg	--	5115	mg/kg	M	--	--	ND	--	--
	Cadmium	6.4	mg/kg	--	6.4	mg/kg	M	--	--	ND	--	--
	Chromium	2822	mg/kg	--	2822	mg/kg	M	--	--	ND	--	--
	Copper	277	mg/kg	--	277	mg/kg	M	--	--	ND	--	--
	Manganese	514	mg/kg	--	514	mg/kg	M	--	--	ND	--	--
	Mercury (total) Hot Spot Value	80838	mg/kg	--	80838	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.32	mg/kg	--	0.32	mg/kg	M	--	--	ND	--	--
	Nickel	49.8	mg/kg	--	49.8	mg/kg	M	--	--	ND	--	--
	Silver	22.1	mg/kg	--	22.1	mg/kg	M	--	--	ND	--	--
	Thallium	10.1	mg/kg	--	10.1	mg/kg	M	--	--	ND	--	--
	Vanadium	68.4	mg/kg	--	68.4	mg/kg	M	--	--	ND	--	--
	Zinc	23985	mg/kg	--	23985	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	--	192	mg/kg	M	4.5E-6	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	6E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	--	2.4	mg/kg	M	5.6E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	4E-8
	Benzo[a]pyrene	2.8	mg/kg	--	2.8	mg/kg	M	6.6E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	5E-7
	Benzo[b]fluoranthene	3.2	mg/kg	--	3.2	mg/kg	M	7.5E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	5E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	--	0.90	mg/kg	M	2.1E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	--	1.7	mg/kg	M	4.0E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-8
	Naphthalene	49	mg/kg	--	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	--	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	--	4.4	mg/kg	M	1.0E-7	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	2E-7
	(Total)											1E-6
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	9.9	mg/kg	0.03	9.9	mg/kg	M	2.2E-08	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-8
	Cadmium	6.4	mg/kg	0.001	6.4	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Bis[2-ethylhexyl]phthalate	192	mg/kg	0.10	192	mg/kg	M	1.4E-6	mg/kg-day	1.4E-2	(mg/kg-day) $^{-1}$	2E-8
	PAHs											
	Benz[a]anthracene	2.4	mg/kg	0.13	2.4	mg/kg	M	2.3E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	2.8	mg/kg	0.13	2.8	mg/kg	M	2.7E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-7
	Benzo[b]fluoranthene	3.2	mg/kg	0.13	3.2	mg/kg	M	3.1E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Dibenz[a,h]anthracene	0.90	mg/kg	0.13	0.90	mg/kg	M	8.7E-9	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	6E-8
	Indeno[1,2,3-cd]pyrene	1.7	mg/kg	0.13	1.7	mg/kg	M	1.7E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	1E-8
	Naphthalene	49	mg/kg	0.13	49	mg/kg	M	--	--	ND	--	--
	2-Methylnaphthalene	6.3	mg/kg	0.13	6.3	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	4.6E-8	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	9E-8
	(Total)											5E-7
											Total Risk Across all Exposure Pathways:	2E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen

PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 8.18.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Antimony	11.4	mg/kg	--	11.4	mg/kg	M	--	--	ND	--	--
	Arsenic	18.6	mg/kg	--	18.6	mg/kg	M	2.6E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	4E-8
	Barium	1855	mg/kg	--	1855	mg/kg	M	--	--	ND	--	--
	Cadmium	7.5	mg/kg	--	7.5	mg/kg	M	--	--	ND	--	--
	Chromium	1488	mg/kg	--	1488	mg/kg	M	--	--	ND	--	--
	Copper	1521	mg/kg	--	1521	mg/kg	M	--	--	ND	--	--
	Manganese	3655	mg/kg	--	3655	mg/kg	M	--	--	ND	--	--
	Mercury (total)	732	mg/kg	--	732	mg/kg	M	--	--	ND	--	--
	Methylmercury	0.0074	mg/kg	--	0.0074	mg/kg	M	--	--	ND	--	--
	Nickel	81	mg/kg	--	81	mg/kg	M	--	--	ND	--	--
	Selenium	7.4	mg/kg	--	7.4	mg/kg	M	--	--	ND	--	--
	Silver	24	mg/kg	--	24	mg/kg	M	--	--	ND	--	--
	Thallium	4.2	mg/kg	--	4.2	mg/kg	M	--	--	ND	--	--
	Vanadium	271	mg/kg	--	271	mg/kg	M	--	--	ND	--	--
	Zinc	7451	mg/kg	--	7451	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Carbazole	3.7	mg/kg	--	3.7	mg/kg	M	5.2E-9	mg/kg-day	2.0E-2	(mg/kg-day) $^{-1}$	1E-10
	Dibenzofuran	4.5	mg/kg	--	4.5	mg/kg	M	--	--	ND	--	--
	Toluene	19	mg/kg	--	19	mg/kg	M	--	--	ND	--	--
	Xylenes	31	mg/kg	--	31	mg/kg	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	--	2.4	mg/kg	M	--	--	ND	--	--
	Benz[a]anthracene	18	mg/kg	--	18	mg/kg	M	2.6E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	15	mg/kg	--	15	mg/kg	M	2.1E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-7
	Benzo[b]fluoranthene	18	mg/kg	--	18	mg/kg	M	2.5E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[ghi]perylene	2.9	mg/kg	--	2.9	mg/kg	M	--	--	ND	--	--
	Benzo[k]fluoranthene	2.5	mg/kg	--	2.5	mg/kg	M	3.5E-9	mg/kg-day	7.3E-2	(mg/kg-day) $^{-1}$	3E-10
	Dibenz[a,h]anthracene	0.26	mg/kg	--	0.26	mg/kg	M	3.7E-10	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	3E-9
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	--	3.1	mg/kg	M	4.3E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-9
	Naphthalene	6.0	mg/kg	--	6.0	mg/kg	M	--	--	ND	--	--
	PCBs (as Aroclor 1254)	4.4	mg/kg	--	4.4	mg/kg	M	6.2E-9	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-8
	(Total)											2E-07

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Undeveloped Area Subsurface Soil (1-20 ft.)
Receptor Population: Construction Worker
Receptor Age: Adult

Table 8.18.Central Tendency (Continued)
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Absorption Factor[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal	**Metals and Organometallic Analytes**											
Absorption	Arsenic	18.6	mg/kg	0.03	18.6	mg/kg	M	5.2E-9	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	8E-09
	Cadmium	7.5	mg/kg	0.001	7.5	mg/kg	M	--	--	ND	--	--
	Organic Analytes											
	Carbazole	3.7	mg/kg	0.10	3.7	mg/kg	M	3.4E-9	mg/kg-day	2.0E-2	(mg/kg-day) $^{-1}$	7E-11
	Dibenzofuran	4.5	mg/kg	0.10	4.5	mg/kg	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	2.4	mg/kg	0.13	2.4	mg/kg	M	--	--	ND	--	--
	Benz[a]anthracene	18	mg/kg	0.13	18	mg/kg	M	2.2E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[a]pyrene	15	mg/kg	0.13	15	mg/kg	M	1.8E-8	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	1E-7
	Benzo[b]fluoranthene	18	mg/kg	0.13	18	mg/kg	M	2.2E-8	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	2E-8
	Benzo[ghi]perylene	2.9	mg/kg	0.13	2.9	mg/kg	M	--	--	ND	--	--
	Benzo[k]fluoranthene	2.5	mg/kg	0.13	2.5	mg/kg	M	3.0E-9	mg/kg-day	7.3E-2	(mg/kg-day) $^{-1}$	2E-10
	Dibenz[a,h]anthracene	0.26	mg/kg	0.13	0.26	mg/kg	M	3.2E-10	mg/kg-day	7.3E+0	(mg/kg-day) $^{-1}$	2E-9
	Indeno[1,2,3-cd]pyrene	3.1	mg/kg	0.13	3.1	mg/kg	M	3.7E-9	mg/kg-day	7.3E-1	(mg/kg-day) $^{-1}$	3E-9
	Naphthalene	6.0	mg/kg	0.13	6.0	mg/kg	M	--	--	ND	--	--
	PCBs (Total)	4.4	mg/kg	0.14	4.4	mg/kg	M	5.7E-9	mg/kg-day	2.0E+0	(mg/kg-day) $^{-1}$	1E-8
	(Total)											2E-7
											Total Risk Across all Exposure Pathways:	4E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
PCBs - Polychlorinated biphenyls
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Table 8.19.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	--	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
Dermal	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
											Total Risk Across all Exposure Pathways:	0E+0

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Undeveloped Area Surface Water
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent/Pre-Adolescent

Table 8.20.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	--	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	--	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	--	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
Dermal	**Metals and Organometallic Analytes**											
	Manganese	0.41	mg/L	0.001	0.41	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.018	mg/L	0.001	0.018	mg/L	M	--	--	ND	--	--
	Methylmercury	2.8E-6	mg/L	0.001	2.8E-6	mg/L	M	--	--	ND	--	--
	(Total)											0E+0
											Total Risk Across all Exposure Pathways:	0E+0

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.21.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	3.6E-6	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	5E-6
	Barium	0.42	mg/L	--	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	--	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	--	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	--	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	--	0.060	mg/L	M	2.3E-5	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	1E-6
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	3.4E-6	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	1E-8
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	1.5E-6	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	4E-8
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	--	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	--	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	--	--	ND	--	--
	(Total)											7E-6

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Long-term Worker
Receptor Age: Adult

Table 8.21.Central Tendency (continued)
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal	**Metals and Organometallic Analytes**											
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	2.7E-10	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	4E-10
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	3.7E-8	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	2E-9
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	0.008	0.0087	mg/L	M	2.0E-9	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	6E-12
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	7.2E-9	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	2E-10
	4-Methylphenol	0.028	mg/L	0.0043	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	0.08	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	--	--	ND	--	--
	(Total)											3E-9
											Total Risk Across all Exposure Pathways:	7E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 8.22.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	2.3E-5	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	3E-5
	Barium	0.42	mg/L	--	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	--	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	--	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	--	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	--	0.060	mg/L	M	1.5E-4	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	8E-6
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	2.1E-5	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	6E-8
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	9.9E-6	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	2E-7
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	--	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	--	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	--	--	ND	--	--
	(Total)											4E-5

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Adult

Table 8.22.Central Tendency (Continued)
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal	**Metals and Organometallic Analytes**											
Absorption	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	7.4E-8	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	1E-7
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	1.0E-5	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	5E-7
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	0.008	0.0087	mg/L	M	5.5E-7	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	2E-9
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	2.0E-6	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	5E-8
	4-Methylphenol	0.028	mg/L	0.0043	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	0.08	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	--	--	ND	--	--
	(Total)											7E-7
											Total Risk Across all Exposure Pathways:	4E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
ND - not determined by EPA or not considered to be a carcinogen
UCL - upper confidence limit

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Adult

Table 8.23.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	0.075	mg/m^3	--	0.075	mg/m^3	M	1.0E-04	mg/m^3-day	7.8E-3	m^3-day/mg	8E-7
	Chlorobenzene	0.012	mg/m^3	--	0.012	mg/m^3	M	--	--	ND	--	--
	Chloroethane	0.011	mg/m^3	--	0.011	mg/m^3	M	1.5E-05	mg/m^3-day	8.3E-4	m^3-day/mg	1E-8
	1,4-Dichlorobenzene	0.0050	mg/m^3	--	0.0050	mg/m^3	M	6.7E-06	mg/m^3-day	6.3E-3	m^3-day/mg	4E-8
	1,2-Dichloroethene, isomers	0.021	mg/m^3	--	0.021	mg/m^3	M	--	--	ND	--	--
	4-Methylphenol	0.035	mg/m^3	--	0.035	mg/m^3	M	--	--	ND	--	--
	Toluene	0.89	mg/m^3	--	0.89	mg/m^3	M	--	--	ND	--	--
	Xylenes	0.21	mg/m^3	--	0.21	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	0.055	mg/m^3	--	0.055	mg/m^3	M	--	--	ND	--	--
											Total Risk:	8E-7
											Total Risk Across all Exposure Pathways:	8E-7

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons

[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.

[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2003a) or EPA Integrated Risk Information System (IRIS) (January 2003b). The RfD for 2-methylnaphthalene is that for naphthalene.

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 8.24.Central Tendency
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Ingestion	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	--	0.0094	mg/L	M	3.8E-5	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	6E-5
	Barium	0.42	mg/L	--	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	--	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	--	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	--	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	--	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	--	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	--	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	--	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	--	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	--	0.060	mg/L	M	2.4E-4	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	1E-5
	Chlorobenzene	0.0098	mg/L	--	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	--	0.0087	mg/L	M	3.5E-5	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	1E-7
	1,2-Dichloroethene, isomers	0.023	mg/L	--	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	--	0.0040	mg/L	M	1.6E-5	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	4E-7
	4-Methylphenol	0.028	mg/L	--	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	--	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	--	0.16	mg/L	M	--	--	ND	--	--
	PAHs											
	2-Methylnaphthalene	0.0010	mg/L	--	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	--	0.044	mg/L	M	--	--	ND	--	--
	(Total)											7E-5

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater Sitewide
Receptor Population: Resident
Receptor Age: Child

Table 8.24.Central Tendency (Continued)
Calculation of Cancer Risks
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units	Dermal Permeability Constant[b]	Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[c]	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	**Metals and Organometallic Analytes**											
	Arsenic	0.0094	mg/L	0.001	0.0094	mg/L	M	1.1E-7	mg/kg-day	1.5E+0	(mg/kg-day) $^{-1}$	2E-7
	Barium	0.42	mg/L	0.001	0.42	mg/L	M	--	--	ND	--	--
	Cadmium	0.0028	mg/L	0.001	0.0028	mg/L	M	--	--	ND	--	--
	Copper	0.096	mg/L	0.001	0.096	mg/L	M	--	--	ND	--	--
	Manganese	1.9	mg/L	0.001	1.9	mg/L	M	--	--	ND	--	--
	Mercury (total)	0.019	mg/L	0.001	0.019	mg/L	M	--	--	ND	--	--
	Methylmercury	0.000011	mg/L	0.001	0.000011	mg/L	M	--	--	ND	--	--
	Nickel	0.042	mg/L	0.0001	0.042	mg/L	M	--	--	ND	--	--
	Thallium	0.0057	mg/L	0.001	0.0057	mg/L	M	--	--	ND	--	--
	Vanadium	0.047	mg/L	0.001	0.047	mg/L	M	--	--	ND	--	--
	Organic Analytes											
	Benzene	0.060	mg/L	0.021	0.060	mg/L	M	1.5E-5	mg/kg-day	5.5E-2	(mg/kg-day) $^{-1}$	8E-7
	Chlorobenzene	0.0098	mg/L	0.041	0.0098	mg/L	M	--	--	ND	--	--
	Chloroethane	0.0087	mg/L	0.008	0.0087	mg/L	M	8.3E-7	mg/kg-day	2.9E-3	(mg/kg-day) $^{-1}$	2E-9
	1,2-Dichloroethene, isomers	0.023	mg/L	0.0013	0.023	mg/L	M	--	--	ND	--	--
	1,4-Dichlorobenzene	0.0040	mg/L	0.062	0.0040	mg/L	M	3.0E-6	mg/kg-day	2.4E-2	(mg/kg-day) $^{-1}$	7E-8
	4-Methylphenol	0.028	mg/L	0.0043	0.028	mg/L	M	--	--	ND	--	--
	Toluene	0.71	mg/L	0.045	0.71	mg/L	M	--	--	ND	--	--
	Xylene	0.16	mg/L	0.08	0.16	mg/L	M	--	--	ND	--	--
	PAHs							0.0E+0				
	2-Methylnaphthalene	0.0010	mg/L	0.069	0.0010	mg/L	M	--	--	ND	--	--
	Naphthalene	0.044	mg/L	0.069	0.044	mg/L	M	--	--	ND	--	--
	(Total)											1E-6
											Total Risk Across all Exposure Pathways:	7E-5

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
PAHs - Polycyclic aromatic hydrocarbons
UCL - upper confidence limit
ND - not determined by EPA or not considered to be a carcinogen

[a]Values for all chemicals reflect the lower of either the UCL on the mean or the maximum concentration.
[b]Absorption factors from U.S. EPA (2004). Toxicity values were adjusted to account for oral absorption in order to calculate risks for dermal exposure (U.S. EPA 2004).
[c]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a), EPA Integrated Risk Information System (IRIS) (EPA 2005b), or the EPA Health Effects Assessment Summary Tables (HEAST) (July 1997a).

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Indoor Air -Showering/Bathing
Receptor Population: Resident
Receptor Age: Child

Table 8.25.Central Tendency
Calculation of Cancer Hazards
Central Tendency Exposure
Ventron/Velsicol Site OU1

Exposure Route	Chemical of Concern	Medium EPC Value[a]	Medium Units		Route EPC	Route EPC Units	EPC Applied	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor[b]	Cancer Slope Factor Units	Cancer Risk
Inhalation	**Organic Analytes**											
	Benzene	0.10	mg/m^3	--	0.10	mg/m^3	M	1.2E-4	mg/m^3-day	7.8E-3	m^3-day/mg	1E-6
	Chlorobenzene	0.017	mg/m^3	--	0.017	mg/m^3	M	--	--	ND	--	--
	Chloroethane	0.015	mg/m^3	--	0.015	mg/m^3	M	1.8E-5	mg/m^3-day	8.3E-4	m^3-day/mg	1E-8
	1,4-Dichlorobenzene	0.0069	mg/m^3	--	0.0069	mg/m^3	M	8.1E-6	mg/m^3-day	6.3E-3	m^3-day/mg	5E-8
	1,2-Dichloroethene, isomers	0.021	mg/m^3	--	0.021	mg/m^3	M	--	--	ND	--	--
	4-Methylphenol	0.049	mg/m^3	--	0.049	mg/m^3	M	--	--	ND	--	--
	Toluene	1.2	mg/m^3	--	1.2	mg/m^3	M	--	--	ND	--	--
	Xylenes	0.28	mg/m^3	--	0.28	mg/m^3	M	--	--	ND	--	--
	PAHs											
	Naphthalene	0.076	mg/m^3	--	0.076	mg/m^3	M	--	--	ND	--	--
											Total Risk:	1E-6
											Total Risk Across all Exposure Pathways:	1E-6

Note:

-- - not applicable
EPA - U.S. Environmental Protection Agency
EPC - exposure point concentration
M - medium-specific
ND - not determined by EPA or not considered to be a carcinogen
PAHs - Polycyclic aromatic hydrocarbons
[a]Values for all chemicals represent estimated indoor air concentrations derived through application of the Andelman Model as modified by Shaum et al (1994) and site groundwater data.
[b]Toxicity values obtained from either the EPA Region IX (U.S. EPA 2005a) or EPA Integrated Risk Information System (IRIS) (EPA 2005b).

Table 9.1.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.017		0.017
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Benzene	NA	2E-5	NA	2E-5	Benzene	Hematopoietic	NA	0.29	NA	0.29
			(Total)	NA	2E-5	NA	2E-5	(Total)			0.29		0.29
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.014	NA	0.014
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00064	NA	0.00064
			Chloroethane	NA	9E-8	NA	9E-8	Chloroethane	ND	NA	0.000031	NA	0.000031
			1,4-Dichlorobenzene	NA	2E-8	NA	2E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000012	NA	0.000012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0025	NA	0.0025
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.014	NA	0.014
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.010	NA	0.010
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.015	NA	0.015
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.056	NA	0.056
Surface Soil	Surface Soil	Developed Area Surface Soil (unpaved)											
			Arsenic	3.E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.018	NA	0.0071	0.025
			Chromium	--	NA	--	--	Chromium	ND	0.016	NA	--	0.016
			Copper	--	NA	--	--	Copper	ND	0.0057	NA	--	0.0057
			Manganese	--	NA	--	--	Manganese	CNS	0.0057	NA	--	0.0057
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.51	NA	--	0.51
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0076	NA	--	0.0076
			Benzo[a]pyrene	5.E-7	NA	9E-7	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1.E-7	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	9.E-8	NA	2E-7	2E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	4E-6		2E-6	6E-6	(Total)		0.56		0.0071	0.57
			Total Risk Across All Media and Exposure Routes:				**3E-5**		Total Hazard Index Across All Media and Exposure Routes:				**0.93**

Notes:

NA - not applicable

ND - no data available in EPA sources regarding toxicity endpoint

CNS - central nervous system

[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.046
Total immune HI=	0.51
Total kidney HI=	--
Total cardiovascular HI=	0.025
Total body/organ weight HI=	0.015
Total blood HI=	0.31
Total other HI=	0.025

Table 9.2.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.017		0.017
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	2E-5	NA	2E-5	Benzene	Hematopoietic	NA	0.29	NA	0.29
			(Total)	NA	2E-5	NA	2E-5	(Total)			0.29		0.29
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.014	NA	0.014
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00064	NA	0.00064
			Chloroethane	NA	9E-8	NA	9E-8	Chloroethane	ND	NA	0.000031	NA	0.000031
			1,4-Dichlorobenzene	NA	2E-8	NA	2E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000012	NA	0.000012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0025	NA	0.0025
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.014	NA	0.014
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.010	NA	0.010
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.015	NA	0.015
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.056	NA	0.056
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	2.E-6	NA	6E-7	2E-6	Arsenic	Skin/vascular	0.010	NA	0.0040	0.014
			Chromium	--	NA	--	--	Chromium	ND	0.012	NA	--	0.012
			Copper	--	NA	--	--	Copper	ND	0.077	NA	--	0.077
			Manganese	--	NA	--	--	Manganese	CNS	0.0036	NA	--	0.0036
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	2.1	NA	--	2.1
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.017	NA	--	0.017
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0076	NA	--	0.0076
			Benzene	3.E-8	NA	--	3E-8	Benzene	Hematopoietic	0.00034	NA	--	0.00034
			Benz[a]anthracene	1.E-7	NA	2E-7	3E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	7.E-7	NA	1E-6	2E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	9.E-8	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2.E-7	NA	3E-7	5E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	3E-6		3E-6	5E-6	(Total)		2.3		0.0040	2.3

Table 9.2.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	--	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
			Total Risk Across All Media and Exposure Routes:				**9E-5**		Total Hazard Index Across All Media and Exposure Routes:				**5.2**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.46
Total immune HI=	2.8
Total kidney HI=	0.11
Total liver HI=	0.72
Total cardiovascular HI=	0.32
Total body/organ weight HI=	0.094
Total blood HI=	0.51
Total other HI=	0.18

Table 9.3.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.017		0.017
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	2E-5	NA	2E-5	Benzene	Hematopoietic	NA	0.29	NA	0.29
			(Total)	NA	2E-5	NA	2E-5	(Total)			0.29		0.29
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.014	NA	0.014
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00064	NA	0.00064
			Chloroethane	NA	9E-8	NA	9E-8	Chloroethane	ND	NA	0.000031	NA	0.000031
			1,4-Dichlorobenzene	NA	2E-8	NA	2E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000012	NA	0.000012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0025	NA	0.0025
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.014	NA	0.014
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.010	NA	0.010
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.015	NA	0.015
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.056	NA	0.056
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	2.E-6	NA	6E-7	2E-6	Arsenic	Skin/vascular	0.010	NA	0.0040	0.014
			Chromium	--	NA	--	--	Chromium	ND	0.012	NA	--	0.012
			Copper	--	NA	--	--	Copper	ND	0.077	NA	--	0.077
			Manganese	--	NA	--	--	Manganese	CNS	0.0036	NA	--	0.0036
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	0.6	NA	--	0.6
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.017	NA	--	0.017
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0076	NA	--	0.0076
			Benzene	3.E-8	NA	--	3E-8	Benzene	Hematopoietic	0.00034	NA	--	0.00034
			Benz[a]anthracene	--	NA	2E-7	2E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	--	NA	1E-6	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3.E-6	NA	2E-7	3E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	--	NA	3E-7	3E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	4E-6		3E-6	7E-6	(Total)		0.76		0.0040	0.76

Table 9.3.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	9E-8	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
						Total Risk Across All Media and Exposure Routes:	**9E-5**					Total Hazard Index Across All Media and Exposure Routes:	**3.6**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.46
Total immune HI=	1.3
Total kidney HI=	0.11
Total liver HI=	0.72
Total cardiovascular HI=	0.32
Total body/organ weight HI=	0.094
Total blood HI=	0.51
Total other HI=	0.18

Table 9.4.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			Chromium IV particulates	NA	2E-6	NA	2E-6	Chromium IV particulates	Lung	NA	0.0048	NA	0.0048
			(Total)		2E-6		2E-6	(Total)			0.022		0.022
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	9E-11	NA	9E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000003	NA	0.00000003
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.12	NA	0.12
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.76	NA	0.76
			Benz[a]anthracene	NA	1E-7	NA	1E-7	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	1E-6	NA	1E-6	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	1E-7	NA	1E-7	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00042	NA	0.00042
			Benzo[k]fluoranthene	NA	8E-9	NA	8E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	8E-8	NA	8E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-7	NA	1E-7	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	4.8	NA	4.8
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	5.7	NA	5.7
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	2E-6	NA	2E-6	Benzene	Hematopoietic	NA	0.024	NA	0.024
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00108	NA	0.00108
			Chloroethane	NA	2E-7	NA	2E-7	Chloroethane	ND	NA	0.000051	NA	0.000051
			1,4-Dichlorobenzene	NA	4E-8	NA	4E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000020	NA	0.000020
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0042	NA	0.0042
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.023	NA	0.023
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.017	NA	0.017
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.025	NA	0.025
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	0.094	NA	0.094
Surface Soil	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.016	NA	0.0064	0.023
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.036	NA	--	0.036
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0032	NA	0.00083	0.0040
			Chromium	--	NA	--	--	Chromium	ND	0.46	NA	--	0.46
			Copper	--	NA	--	--	Copper	ND	0.0034	NA	--	0.0034
			Manganese	--	NA	--	--	Manganese	CNS	0.0054	NA	--	0.0054
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.30	NA	--	0.30
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0016	NA	--	0.0016
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0012	NA	--	0.0012
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0022	NA	--	0.0022
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.062	NA	--	0.062
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0037	NA	--	0.0037
			Zinc	--	NA	--	--	Zinc	Blood	0.039	NA	--	0.039
			Bis[2-ethylhexyl]phthalate	5E-7	NA	6E-7	1E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0047	NA	0.0062	0.011
			Benz[a]anthracene	3E-7	NA	5E-7	8E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	4E-6	NA	6E-6	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-7	NA	7E-7	1E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	2E-6	3E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0012	NA	0.0021	0.0033
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00077	NA	0.0013	0.0021
			PCBs	2E-6	NA	3E-6	4E-6	PCBs	Immunologic	0.11	NA	0.20	0.31
			(Total)	1E-5		1E-5	2E-5	(Total)		1.1		0.22	1.3

Table 9.4.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	--	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
			Total Risk Across All Media and Exposure Routes:				**9E-5**		Total Hazard Index Across All Media and Exposure Routes:				**9.6**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	1.4
Total immune HI=	1.2
Total kidney HI=	0.15
Total liver HI=	0.77
Total cardiovascular HI=	0.33
Total body/organ weight HI=	5.0
Total blood HI=	0.26
Total other HI=	0.57

Table 9.5.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			Chromium IV particulates	NA	2E-6	NA	2E-6	Chromium IV particulates	Lung	NA	0.0048	NA	0.0048
			(Total)		2E-6		2E-6	(Total)			0.022		0.022
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	9E-11	NA	9E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000003	NA	0.00000003
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.12	NA	0.12
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.76	NA	0.76
			Benz[a]anthracene	NA	1E-7	NA	1E-7	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	1E-6	NA	1E-6	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	1E-7	NA	1E-7	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00042	NA	0.00042
			Benzo[k]fluoranthene	NA	8E-9	NA	8E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	8E-8	NA	8E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-7	NA	1E-7	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	4.8	NA	4.8
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	5.7	NA	5.7
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	2E-6	NA	2E-6	Benzene	Hematopoietic	NA	0.024	NA	0.024
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0011	NA	0.0011
			Chloroethane	NA	2E-7	NA	2E-7	Chloroethane	ND	NA	0.000051	NA	0.000051
			1,4-Dichlorobenzene	NA	4E-8	NA	4E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000020	NA	0.000020
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0042	NA	0.0042
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.023	NA	0.023
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.017	NA	0.017
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.025	NA	0.025
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	0.094	NA	0.094
Surface Soil	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.016	NA	0.0064	0.023
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.036	NA	--	0.036
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0032	NA	0.00083	0.0040
			Chromium	--	NA	--	--	Chromium	ND	0.46	NA	--	0.46
			Copper	--	NA	--	--	Copper	ND	0.0034	NA	--	0.0034
			Manganese	--	NA	--	--	Manganese	CNS	0.0054	NA	--	0.0054
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	13	NA	--	13
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0016	NA	--	0.0016
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0012	NA	--	0.0012
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0022	NA	--	0.0022
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.062	NA	--	0.062
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0037	NA	--	0.0037
			Zinc	--	NA	--	--	Zinc	Blood	0.039	NA	--	0.039
			Bis[2-ethylhexyl]phthalate	5E-7	NA	6E-7	1E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0047	NA	0.0062	0.011
			Benz[a]anthracene	3E-7	NA	5E-7	8E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	4E-6	NA	6E-6	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-7	NA	7E-7	1E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	2E-6	3E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0012	NA	0.0021	0.0033
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00077	NA	0.0013	0.0021
			PCBs	2E-6	NA	3E-6	4E-6	PCBs	Immunologic	0.11	NA	0.20	0.31
			(Total)	1E-5		1E-5	2E-5	(Total)		14		0.22	14

Table 9.5.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	--	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
						Total Risk Across All Media and Exposure Routes:	**9E-5**					Total Hazard Index Across All Media and Exposure Routes:	**23**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	1.4
Total immune HI=	14
Total kidney HI=	0.15
Total liver HI=	0.77
Total cardiovascular HI=	0.33
Total body/organ weight HI=	5.0
Total blood HI=	0.26
Total other HI=	0.57

Table 9.6.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/ Future
Receptor Population: Construction Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Developed Area Subsurface Soil (1-20 ft depth)	Arsenic	3E-7	NA	2E-8	3E-7	Arsenic	Skin/vascular	0.026	NA	0.0015	0.027
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0091	NA	--	0.0091
			Chromium	--	NA	--	--	Chromium	ND	0.034	NA	--	0.034
			Copper	--	NA	--	--	Copper	ND	0.14	NA	--	0.14
			Manganese	--	NA	--	--	Manganese	CNS	0.013	NA	--	0.013
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	7.5	NA	--	7.5
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.052	NA	--	0.052
			Benzene	3E-9	NA	--	3E-9	Benzene	Hematopoietic	0.00054	NA	--	0.00054
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00046	NA	0.00012	0.00058
			PCBs	2E-8	NA	4E-9	2E-8	PCBs	Immunologic	0.014	NA	0.0039	0.018
			(Total)	3E-7		2E-8	4E-7	(Total)		7.8		0.0056	7.8
			Total Risk Across All Media and Exposure Routes:				**4E-7**	Total Hazard Index Across All Media and Exposure Routes:					**7.8**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.013
Total immune HI=	7.5
Total kidney HI=	0.0091
Total liver HI=	0.052
Total cardiovascular HI=	0.027
Total body/organ weight HI=	0.00058
Total blood HI=	0.00054
Total other HI=	0.18

Table 9.7.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Undeveloped Area Subsurface Soil (1-20 ft depth)	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.022	NA	--	0.022
			Arsenic	6E-7	NA	4E-8	7E-7	Arsenic	Skin/vascular	0.048	NA	0.0029	0.051
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.021	NA	--	0.021
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0058	NA	0.00023	0.0060
			Chromium	--	NA	--	--	Chromium	ND	0.38	NA	--	0.38
			Copper	--	NA	--	--	Copper	ND	0.029	NA	--	0.029
			Manganese	--	NA	--	--	Manganese	CNS	0.061	NA	--	0.061
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.9	NA	--	1.9
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.000058	NA	--	0.000058
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0031	NA	--	0.0031
			Selenium					Selenium	Selenosis: liver, CNS, skin	0.0012	NA	--	0.0012
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0038	NA	--	0.0038
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.040	NA	--	0.040
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.023	NA	--	0.023
			Zinc	--	NA	--	--	Zinc	Blood	0.019	NA	--	0.019
			Carbazole	2E-9	NA	3E-10	2E-9	Carbazole	ND	--	NA	--	--
			Dibenzofuran	--	NA	--	--	Dibenzofuran	ND	0.0018	NA	0.00035	0.0021
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.00012	NA	--	0.00012
			Xylene	--	NA			Xylene	Hyperactivity, body weight, mortality	0.00012	NA	--	0.00012
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00046	NA	0.00012	0.00058
			Benz[a]anthracene	3E-7	NA	8E-8	4E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-6	NA	6E-7	3E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-7	NA	8E-8	4E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Benzo[k]fluoranthene	4E-9	NA	1E-9	5E-9	Benzo[k]fluoranthene	ND	--	NA	--	--
			Benzo[ghi]perylene	--	NA	--	--	Benzo[ghi]perylene	Body weight	0.00011	NA	0.000030	0.00014
			Dibenz[a,h]anthracene	4E-8	NA	1E-8	5E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	5E-8	NA	1E-8	6E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.00023	NA	0.000060	0.00029
			PCBs	2E-7	NA	5E-8	2E-7	PCBs	Immunologic	0.17	NA	0.048	0.22
			(Total)	4E-6		9E-7	5E-6	(Total)		2.7		0.051	2.8
			Total Risk Across All Media and Exposure Routes:				**5E-6**		Total Hazard Index Across All Media and Exposure Routes:				**2.8**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.061
Total immune HI=	2.1
Total kidney HI =	0.027
Total liver HI=	0.040
Total cardiovascular HI =	0.05
Total body/organ weight HI=	0.0041
Total blood HI =	0.043
Total other HI=	0.44

Table 9.8.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	2E-6	5E-6	Arsenic	Skin/vascular	0.017	NA	0.0088	0.026
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.038	NA	--	0.038
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0033	NA	0.0011	0.0045
			Chromium	--	NA	--	--	Chromium	ND	0.49	NA	--	0.49
			Copper	--	NA	--	--	Copper	ND	0.0036	NA	--	0.0036
			Manganese	--	NA	--	--	Manganese	CNS	0.0057	NA	--	0.0057
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.31	NA	--	0.31
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0017	NA	--	0.0017
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0013	NA	--	0.0013
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0023	NA	--	0.0023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.065	NA	--	0.065
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0039	NA	--	0.0039
			Zinc	--	NA	--	--	Zinc	Blood	0.041	NA	--	0.041
			Bis[2-ethylhexyl]phthalate	6E-7	NA	1E-6	2E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0050	NA	0.0085	0.0134
			Benz[a]anthracene	4E-7	NA	9E-7	1E-6	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-6	NA	1E-5	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-7	NA	1E-6	2E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	3E-6	5E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-7	NA	6E-7	9E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--				Napthalene	Body weight	0.0013		0.0028	0.0041
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00082	NA	0.0018	0.0026
			PCBs	2E-6	NA	5E-6	7E-6	PCBs	Immunologic	0.11	NA	0.27	0.39
			(Total)	1E-5		2E-5	4E-5	(Total)		1.1		0.30	1.4
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.015	NA	0.0078	0.023
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0047	NA	0.0016	0.0063
			Chromium	--	NA	--	--	Chromium	ND	0.027	NA	--	0.027
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	2.2	NA	--	2.2
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00065	NA	--	0.00065
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.031	NA	--	0.031
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0040	NA	--	0.0040
			Zinc	--	NA	--	--	Zinc	Blood	0.0061	NA	--	0.0061
			Benz[a]anthracene	3E-7	NA	6E-7	9E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-6	NA	6E-6	8E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-7	NA	6E-7	9E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-7	NA	8E-7	1E-6	PCBs	Immunologic	0.019	NA	0.045	0.064
			(Total)	7E-6		1E-5	2E-5	(Total)		2.3		0.055	2.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00055	NA	0.0065	0.0071
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0036	NA	0.025	0.028
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000017	NA	0.00000082	0.0000025
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0042		0.031	0.035
			Total Risk Across All Media and Exposure Routes:				**5E-5**	Total Hazard Index Across All Media and Exposure Routes:					**3.8**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.015
Total immune HI=	3.0
Total kidney HI=	0.049
Total liver HI=	0.096
Total cardiovascular HI=	0.049
Total body/organ weight HI=	0.021
Total blood HI=	0.055
Total other HI=	0.54

Table 9.9.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.023	NA	--	0.023
			Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.024	NA	0.0088	0.033
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.054	NA	--	0.054
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0048	NA	0.00114	0.0059
			Chromium	--	NA	--	--	Chromium	ND	0.69	NA	--	0.69
			Copper	--	NA	--	--	Copper	ND	0.0051	NA	--	0.0051
			Manganese	--	NA	--	--	Manganese	CNS	0.0081	NA	--	0.0081
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.45	NA	--	0.45
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0024	NA	--	0.0024
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0018	NA	--	0.0018
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0033	NA	--	0.0033
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.094	NA	--	0.094
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0056	NA	--	0.0056
			Zinc	--	NA	--	--	Zinc	Blood	0.059	NA	--	0.059
			Bis[2-ethylhexyl]phthalate	3E-7	NA	3E-7	6E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0071	NA	0.0085	0.016
			Benz[a]anthracene	2E-7	NA	3E-7	4E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-6	NA	3E-6	5E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-7	NA	3E-7	6E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-7	NA	2E-7	3E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.0018	NA	0.0028	0.0046
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.0012	NA	0.0018	0.0030
			PCBs	8E-7	NA	1E-6	2E-6	PCBs	Immunologic	0.16	NA	0.27	0.44
			(Total)	6E-6		7E-6	1E-5	(Total)		1.6		0.30	1.9
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.022	NA	0.0078	0.029
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0067	NA	0.0016	0.0083
			Chromium	--	NA	--	--	Chromium	ND	0.038	NA	--	0.038
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	3.2	NA	--	3.2
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00093	NA	--	0.00093
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.044	NA	--	0.044
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0057	NA	--	0.0057
			Zinc	--	NA	--	--	Zinc	Blood	0.0087	NA	--	0.0087
			Benz[a]anthracene	1E-7	NA	2E-7	3E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-6	3E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	3E-7	6E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	8E-8	NA	1E-7	2E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	1E-7	NA	2E-7	4E-7	PCBs	Immunologic	0.027	NA	0.045	0.072
			(Total)	3E-6		3E-6	6E-6	(Total)		3.3		0.055	3.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00078	NA	0.0065	0.0073
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0052	NA	0.025	0.030
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000025	NA	0.00000082	0.0000033
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0060		0.031	0.037
			Total Risk Across All Media and Exposure Routes:				**2E-5**	Total Hazard Index Across All Media and Exposure Routes:					**5.3**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.019
Total immune HI=	4.2
Total kidney HI=	0.068
Total liver HI=	0.14
Total cardiovascular HI=	0.063
Total body/organ weight HI=	0.025
Total blood HI=	0.079
Total other HI=	0.76

Table 9.10.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	2E-6	5E-6	Arsenic	Skin/vascular	0.017	NA	0.0088	0.026
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.038	NA	--	0.038
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0033	NA	0.00114	0.0045
			Chromium	--	NA	--	--	Chromium	ND	0.49	NA	--	0.49
			Copper	--	NA	--	--	Copper	ND	0.0036	NA	--	0.0036
			Manganese	--	NA	--	--	Manganese	CNS	0.0057	NA	--	0.0057
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	14	NA	--	14
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0017	NA	--	0.0017
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0013	NA	--	0.0013
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0023	NA	--	0.0023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.065	NA	--	0.065
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0039	NA	--	0.0039
			Zinc	--	NA	--	--	Zinc	Blood	0.041	NA	--	0.041
			Bis[2-ethylhexyl]phthalate	6E-7	NA	1E-6	2E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0050	NA	0.0085	0.0134
			Benz[a]anthracene	4E-7	NA	9E-7	1E-6	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-6	NA	1E-5	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-7	NA	1E-6	2E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	3E-6	5E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-7	NA	6E-7	9E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--				Napthalene	Body weight	0.0013		0.0028	0.0041
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00082	NA	0.0018	0.0026
			PCBs	2E-6	NA	5E-6	7E-6	PCBs	Immunologic	0.11	NA	0.27	0.39
			(Total)	1E-5		2E-5	4E-5	(Total)		15		0.30	15
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.015	NA	0.0078	0.023
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0047	NA	0.0016	0.0063
			Chromium	--	NA	--	--	Chromium	ND	0.027	NA	--	0.027
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	2.2	NA	--	2.2
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00065	NA	--	0.00065
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.031	NA	--	0.031
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0040	NA	--	0.0040
			Zinc	--	NA	--	--	Zinc	Blood	0.0061	NA	--	0.0061
			Benz[a]anthracene	3E-7	NA	6E-7	9E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-6	NA	6E-6	8E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-7	NA	6E-7	9E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-7	NA	8E-7	1E-6	PCBs	Immunologic	0.019	NA	0.045	0.064
			(Total)	7E-6		1E-5	2E-5	(Total)		2.3		0.055	2.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00055	NA	0.0065	0.0071
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0036	NA	0.025	0.028
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000017	NA	0.00000082	0.0000025
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0042		0.031	0.035
			Total Risk Across All Media and Exposure Routes:				**5E-5**	Total Hazard Index Across All Media and Exposure Routes:					**17**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.015
Total immune HI=	17
Total kidney HI=	0.049
Total liver HI=	0.096
Total cardiovascular HI=	0.049
Total body/organ weight HI=	0.021
Total blood HI=	0.055
Total other HI=	0.54

Table 9.11.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.023	NA	--	0.023
			Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.024	NA	0.0088	0.033
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.054	NA	--	0.054
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0048	NA	0.00114	0.0059
			Chromium	--	NA	--	--	Chromium	ND	0.69	NA	--	0.69
			Copper	--	NA	--	--	Copper	ND	0.0051	NA	--	0.0051
			Manganese	--	NA	--	--	Manganese	CNS	0.0081	NA	--	0.0081
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	20	NA	--	20
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0024	NA	--	0.0024
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0018	NA	--	0.0018
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0033	NA	--	0.0033
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.094	NA	--	0.094
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0056	NA	--	0.0056
			Zinc	--	NA	--	--	Zinc	Blood	0.059	NA	--	0.059
			Bis[2-ethylhexyl]phthalate	3E-7	NA	3E-7	6E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0071	NA	0.0085	0.016
			Benz[a]anthracene	2E-7	NA	3E-7	4E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-6	NA	3E-6	5E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-7	NA	3E-7	6E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-7	NA	2E-7	3E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.0018	NA	0.0028	0.0046
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.0012	NA	0.0018	0.0030
			PCBs	8E-7	NA	1E-6	2E-6	PCBs	Immunologic	0.16	NA	0.27	0.44
			(Total)	6E-6		7E-6	1E-5	(Total)		21		0.30	21
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.022	NA	0.0078	0.029
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0067	NA	0.0016	0.0083
			Chromium	--	NA	--	--	Chromium	ND	0.038	NA	--	0.038
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	3.2	NA	--	3.2
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00093	NA	--	0.00093
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.044	NA	--	0.044
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0057	NA	--	0.0057
			Zinc	--	NA	--	--	Zinc	Blood	0.0087	NA	--	0.0087
			Benz[a]anthracene	1E-7	NA	2E-7	3E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-6	3E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	3E-7	6E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	8E-8	NA	1E-7	2E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	1E-7	NA	2E-7	4E-7	PCBs	Immunologic	0.027	NA	0.045	0.072
			(Total)	3E-6		3E-6	6E-6	(Total)		3.3		0.055	3.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00078	NA	0.0065	0.0073
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0052	NA	0.025	0.030
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000025	NA	0.00000082	0.0000033
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0060		0.031	0.037
			Total Risk Across All Media and Exposure Routes:				**2E-5**		Total Hazard Index Across All Media and Exposure Routes:				**25**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.019
Total immune HI=	24
Total kidney HI=	0.068
Total liver HI=	0.14
Total cardiovascular HI=	0.063
Total body/organ weight HI=	0.025
Total blood HI=	0.079
Total other HI=	0.76

Table 9.12.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	1E-4	NA	1E-4	Benzene	Hematopoietic	NA	1.4	NA	1.4
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.12	NA	0.12
			Chloroethane	NA	2E-6	NA	2E-6	Chloroethane	ND	NA	0.00062	NA	0.00062
			1,4-Dichlorobenzene	NA	8E-6	NA	8E-6	1,4-Dichlorobenzene	Increased liver weight	NA	0.0036	NA	0.0036
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.23	NA	0.23
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	1.2	NA	1.2
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	1.3	NA	1.3
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	1.2	NA	1.2
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	11	NA	11
			(Total)	NA	2E-4	NA	2E-4	(Total)		NA	16	NA	16
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	2E-4	NA	9E-7	2E-4	Arsenic	Skin/vascular	0.86	NA	0.0045	0.86
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.16	NA	0.012	0.18
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.15	NA	0.032	0.19
			Copper	--	NA	--	--	Copper	ND	0.066	NA	0.00034	0.07
			Manganese	--	NA	--	--	Manganese	CNS	1.1	NA	0.15	1.3
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.7	NA	0.13	1.9
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0029	NA	0.000015	0.0029
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.057	NA	0.00075	0.058
			Thallium	--	NA	--	--	Thallium	Liver enzymes	1.9	NA	0.010	2.0
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.14	NA	0.029	0.17
			Benzene	4E-5	NA	4E-6	4E-5	Benzene	Hematopoietic	0.41	NA	0.045	0.46
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.013	NA	0.0029	0.016
			Chloroethane	3E-7	NA	1E-8	--	Chloroethane	ND	0.00060	NA	0.000025	0.00062
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.031	NA	0.00021	0.031
			1,4-Dichlorobenzene	1E-6	NA	4E-7	1E-6	1,4-Dichlorobenzene	ND	0.0037	NA	0.0012	0.0048
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.16	NA	0.0035	0.16
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.097	NA	0.023	0.12
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.023	NA	0.0094	0.032
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0068	NA	0.0025	0.0093
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.061	NA	0.022	0.083
			(Total)	2E-4		5E-6	2E-4	(Total)		7.1		0.48	8
			Total Risk Across All Media and Exposure Routes:				**4E-4**		Total Risk Across All Media and Exposure Routes:				**23**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	3.7
Total immune HI=	1.9
Total kidney HI=	0.36
Total liver HI=	2.0
Total cardiovascular HI =	0.86
Total body/organ weight HI =	11
Total blood HI =	2.0
Total other HI =	1.7

Table 9.13.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	9E-5	NA	9E-5	Benzene	Hematopoietic	NA	4.4	NA	4.4
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.36	NA	0.36
			Chloroethane	NA	1E-6	NA	1E-6	Chloroethane	ND	NA	0.0019	NA	0.0019
			1,4-Dichlorobenzene	NA	5E-6	NA	5E-6	1,4-Dichlorobenzene	Increased liver weight	NA	0.011	NA	0.011
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.71	NA	0.71
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	3.5	NA	3.5
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	3.9	NA	3.9
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	3.6	NA	3.6
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	32	NA	32
			(Total)	NA	9E-5	NA	9E-5	(Total)		NA	49	NA	49
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	1E-4	NA	5E-7	1E-4	Arsenic	Skin/vascular	3.0	NA	0.013	3.0
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.58	NA	0.036	0.61
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.54	NA	0.095	0.63
			Copper	--	NA	--	--	Copper	ND	0.23	NA	0.0010	0.23
			Manganese	--	NA	--	--	Manganese	CNS	3.9	NA	0.43	4.4
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	6.1	NA	0.38	6.5
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.010	NA	0.000045	0.010
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.20	NA	0.0022	0.20
			Thallium	--	NA	--	--	Thallium	Liver enzymes	6.8	NA	0.030	6.8
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.50	NA	0.085	0.59
			Benzene	3E-5	NA	3E-6	3E-5	Benzene	Hematopoietic	1.4	NA	0.13	1.6
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.047	NA	0.0085	0.055
			Chloroethane	2E-7	NA	7E-9	--	Chloroethane	ND	0.0021	NA	0.000073	0.0022
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.11	NA	0.00062	0.11
			1,4-Dichlorobenzene	8E-7	NA	2E-7	1E-6	1,4-Dichlorobenzene	ND	0.013	NA	0.0035	0.016
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.54	NA	0.010	0.55
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.34	NA	0.067	0.41
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.079	NA	0.028	0.11
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.024	NA	0.0073	0.031
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.21	NA	0.065	0.28
			(Total)	1E-4		3E-6	1E-4	(Total)		25		1.4	3E+1
			Total Risk Across All Media and Exposure Routes:				**2E-4**		Total Risk Across All Media and Exposure Routes:				**75**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	12
Total immune HI=	6.5
Total kidney HI=	1.2
Total liver HI=	7.0
Total cardiovascular HI =	3.0
Total body/organ weight HI =	33
Total blood HI =	6.5
Total other HI =	5.4

Table 9.1.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.0059		0.0059
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	3E-6	NA	3E-6	Benzene	Hematopoietic	NA	0.11	NA	0.11
			(Total)	NA	3E-6	NA	3E-6	(Total)			0.11		0.11
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	2E-7	NA	2E-7	Benzene	Hematopoietic	NA	0.0055	NA	0.0055
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00025	NA	0.00025
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000012	NA	0.000012
			1,4-Dichlorobenzene	NA	3E-9	NA	3E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000048	NA	0.0000048
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0010	NA	0.0010
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0053	NA	0.0053
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0040	NA	0.0040
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0059	NA	0.0059
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	0.022	NA	0.022
Surface Soil	Surface Soil	Developed Area Surface Soil (unpaved)	Arsenic	9E-7	NA	4E-8	9E-7	Arsenic	Skin/vascular	0.016	NA	0.00062	0.016
			Chromium	--	NA	--	--	Chromium	ND	0.014	NA	--	0.014
			Copper	--	NA	--	--	Copper	ND	0.0050	NA	--	0.0050
			Manganese	--	NA	--	--	Manganese	CNS	0.0050	NA	--	0.0050
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.44	NA	--	0.44
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0067	NA	--	0.0067
			Benzo[a]pyrene	2E-7	NA	3E-8	2E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-8	NA	5E-9	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	3E-8	NA	5E-9	3E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	1E-6		7E-8	1E-6	(Total)		0.49		0.00062	0.49
			Total Risk Across All Media and Exposure Routes:				**5E-6**	Total Hazard Index Across All Media and Exposure Routes:					**0.63**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.020
Total immune HI=	0.44
Total kidney HI=	--
Total cardiovascular HI=	0.016
Total body/organ weight HI=	0.0059
Total blood HI=	0.13
Total other HI=	0.020

Table 9.2.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.0059		0.0059
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	3E-6	NA	3E-6	Benzene	Hematopoietic	NA	0.11	NA	0.11
			(Total)	NA	3E-6	NA	3E-6	(Total)			0.11		0.11
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	2E-7	NA	2E-7	Benzene	Hematopoietic	NA	0.0055	NA	0.0055
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00025	NA	0.00025
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000012	NA	0.000012
			1,4-Dichlorobenzene	NA	3E-9	NA	3E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000048	NA	0.0000048
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0010	NA	0.0010
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0053	NA	0.0053
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0040	NA	0.0040
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0059	NA	0.0059
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	0.022	NA	0.022
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	5E-7	NA	2E-8	5E-7	Arsenic	Skin/vascular	0.0089	NA	0.00035	0.0092
			Chromium	--	NA	--	--	Chromium	ND	0.011	NA	--	0.011
			Copper	--	NA	--	--	Copper	ND	0.067	NA	--	0.067
			Manganese	--	NA	--	--	Manganese	CNS	0.0031	NA	--	0.0031
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.9	NA	--	1.9
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.015	NA	--	0.015
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0067	NA	--	0.0067
			Benzene	8.E-9	NA	--	8E-9	Benzene	Hematopoietic	0.00030	NA	--	0.00030
			Benz[a]anthracene	3.E-8	NA	5E-9	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2.E-7	NA	4E-8	3E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3.E-8	NA	5E-9	3E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6.E-8	NA	1E-8	7E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	9E-7		8E-8	1E-6	(Total)		2.0		0.00035	2.0

Table 9.2.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.0000071	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.000071	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	--	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.00075	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**2.9**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.14
Total immune HI=	2.1
Total kidney HI=	0.035
Total liver HI=	0.23
Total cardiovascular HI=	0.10
Total body/organ weight HI=	0.030
Total blood HI=	0.19
Total other HI=	0.11

Table 9.3.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	0.00	NA	0.00	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			(Total)	NA	1E-8	NA	1E-8	(Total)			0.0059		0.0059
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	3E-6	NA	3E-6	Benzene	Hematopoietic	NA	0.11	NA	0.11
			(Total)	NA	3E-6	NA	3E-6	(Total)			0.11		0.11
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	2E-7	NA	2E-7	Benzene	Hematopoietic	NA	0.0055	NA	0.0055
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00025	NA	0.00025
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000012	NA	0.000012
			1,4-Dichlorobenzene	NA	3E-9	NA	3E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000048	NA	0.0000048
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0010	NA	0.0010
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0053	NA	0.0053
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0040	NA	0.0040
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0059	NA	0.0059
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	0.022	NA	0.022
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	5E-7	NA	2E-8	5E-7	Arsenic	Skin/vascular	0.0089	NA	0.00035	0.0092
			Chromium	--	NA	--	--	Chromium	ND	0.011	NA	--	0.011
			Copper	--	NA	--	--	Copper	ND	0.067	NA	--	0.067
			Manganese	--	NA	--	--	Manganese	CNS	0.0031	NA	--	0.0031
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	0.28	NA	--	0.28
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.015	NA	--	0.015
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0067	NA	--	0.0067
			Benzene	8.E-9	NA	--	8E-9	Benzene	Hematopoietic	0.00030	NA	--	0.00030
			Benz[a]anthracene	3.E-8	NA	5E-9	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2.E-7	NA	4E-8	3E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3.E-8	NA	5E-9	3E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6.E-8	NA	1E-8	7E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	9E-7		8E-8	1E-6	(Total)		0.39		0.00035	0.39

Table 9.3.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.0000071	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.000071	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	1E-8	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.00075	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**1.3**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.14
Total immune HI=	0.47
Total kidney HI=	0.035
Total liver HI=	0.23
Total cardiovascular HI=	0.10
Total body/organ weight HI=	0.030
Total blood HI=	0.19
Total other HI=	0.11

Table 9.4.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			Chromium IV particulates	NA	3E-7	NA	3E-7	Chromium IV particulates	Lung	NA	0.0017	NA	0.0017
			(Total)		3E-7		3E-7	(Total)			0.0076		0.0076
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	1E-11	NA	1E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000001	NA	0.00000001
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.046	NA	0.046
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.30	NA	0.30
			Benz[a]anthracene	NA	2E-8	NA	2E-8	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	2E-7	NA	2E-7	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	2E-8	NA	2E-8	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00017	NA	0.00017
			Benzo[k]fluoranthene	NA	1E-9	NA	1E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	1E-8	NA	1E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-8	NA	1E-8	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	1.9	NA	1.9
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	2.3	NA	2.3
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	3E-7	NA	3E-7	Benzene	Hematopoietic	NA	0.0093	NA	0.0093
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00043	NA	0.00043
			Chloroethane	NA	2E-8	NA	2E-8	Chloroethane	ND	NA	0.000020	NA	0.000020
			1,4-Dichlorobenzene	NA	5E-9	NA	5E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000080	NA	0.0000080
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0017	NA	0.0017
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0090	NA	0.0090
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0067	NA	0.0067
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.010	NA	0.010
			(Total)	NA	3E-7	NA	3E-7	(Total)		NA	0.037	NA	0.037
Surface Soil	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.014	NA	--	0.014
			Arsenic	8E-7	NA	3E-8	9E-7	Arsenic	Skin/vascular	0.014	NA	0.00056	0.015
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.031	NA	--	0.031
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0028	NA	0.000073	0.0028
			Chromium	--	NA	--	--	Chromium	ND	0.40	NA	--	0.40
			Copper	--	NA	--	--	Copper	ND	0.0030	NA	--	0.0030
			Manganese	--	NA	--	--	Manganese	CNS	0.0047	NA	--	0.0047
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.26	NA	--	0.26
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0014	NA	--	0.0014
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0011	NA	--	0.0011
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0019	NA	--	0.0019
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.054	NA	--	0.054
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0033	NA	--	0.0033
			Zinc	--	NA	--	--	Zinc	Blood	0.034	NA	--	0.034
			Bis[2-ethylhexyl]phthalate	1E-7	NA	2E-8	2E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0041	NA	0.00054	0.0047
			Benz[a]anthracene	1E-7	NA	2E-8	1E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-7	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-8	2E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-7	NA	6E-8	4E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	7E-8	NA	1E-8	8E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	0E+0	Naphthalene	Body weight	0.0010	NA	0.00018	0.0012
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00068	NA	0.00012	0.00079
			PCBs	5E-7	NA	9E-8	6E-7	PCBs	Immunologic	0.094	NA	0.017	0.11
			(Total)	3E-6		4E-7	4E-6	(Total)		0.93		0.019	0.95

Table 9.4.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.0000071	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.000071	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	--	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.00075	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**4.0**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.50
Total immune HI=	0.56
Total kidney HI=	0.069
Total liver HI=	0.27
Total cardiovascular HI=	0.11
Total body/organ weight HI=	2.0
Total blood HI=	0.11
Total other HI=	0.45

Table 9.5.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			Chromium IV particulates	NA	3E-7	NA	3E-7	Chromium IV particulates	Lung	NA	0.0017	NA	0.0017
			(Total)		3E-7		3E-7	(Total)			0.0076		0.0076
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	1E-11	NA	1E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000001	NA	0.00000001
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.046	NA	0.046
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.30	NA	0.30
			Benz[a]anthracene	NA	2E-8	NA	2E-8	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	2E-7	NA	2E-7	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	2E-8	NA	2E-8	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00017	NA	0.00017
			Benzo[k]fluoranthene	NA	1E-9	NA	1E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	1E-8	NA	1E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-8	NA	1E-8	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	1.9	NA	1.9
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	2.3	NA	2.3
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	3E-7	NA	3E-7	Benzene	Hematopoietic	NA	0.0093	NA	0.0093
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00043	NA	0.00043
			Chloroethane	NA	2E-8	NA	2E-8	Chloroethane	ND	NA	0.000020	NA	0.000020
			1,4-Dichlorobenzene	NA	5E-9	NA	5E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000080	NA	0.0000080
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0017	NA	0.0017
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0090	NA	0.0090
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0067	NA	0.0067
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0099	NA	0.0099
			(Total)	NA	3E-7	NA	3E-7	(Total)		NA	0.037	NA	0.037
Surface	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.014	NA	--	0.014
			Arsenic	8E-7	NA	3E-8	9E-7	Arsenic	Skin/vascular	0.014	NA	0.00056	0.015
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.031	NA	--	0.031
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0028	NA	0.000073	0.0028
			Chromium	--	NA	--	--	Chromium	ND	0.40	NA	--	0.40
			Copper	--	NA	--	--	Copper	ND	0.0030	NA	--	0.0030
			Manganese	--	NA	--	--	Manganese	CNS	0.0047	NA	--	0.0047
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	5.8	NA	--	5.8
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0014	NA	--	0.0014
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0011	NA	--	0.0011
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0019	NA	--	0.0019
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.054	NA	--	0.054
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0033	NA	--	0.0033
			Zinc	--	NA	--	--	Zinc	Blood	0.034	NA	--	0.034
			Bis[2-ethylhexyl]phthalate	1E-7	NA	2E-8	2E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0041	NA	0.00054	0.0047
			Benz[a]anthracene	1E-7	NA	2E-8	1E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-7	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-8	2E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-7	NA	6E-8	4E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	7E-8	NA	1E-8	8E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0010	NA	0.00018	0.0012
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00068	NA	0.00012	0.0008
			PCBs	5E-7	NA	9E-8	6E-7	PCBs	Immunologic	0.094	NA	0.017	0.11
			(Total)	3E-6		4E-7	4E-6	(Total)		6.4		0.019	6.5

Table 9.5.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.0000071	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.000071	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	--	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.00075	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**10**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.50
Total immune HI=	6.1
Total kidney HI=	0.069
Total liver HI=	0.27
Total cardiovascular HI=	0.11
Total body/organ weight HI=	2.0
Total blood HI=	0.11
Total other HI=	0.45

Table 9.6.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/ Future
Receptor Population: Construction Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Developed Area Subsurface Soil (1-20 ft depth)	Arsenic	2E-8	NA	4E-9	2E-8	Arsenic	Skin/vascular	0.0032	NA	0.00032	0.0035
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0011	NA	--	0.0011
			Chromium	--	NA	--	--	Chromium	ND	0.0043	NA	--	0.0043
			Copper	--	NA	--	--	Copper	ND	0.018	NA	--	0.018
			Manganese	--	NA	--	--	Manganese	CNS	0.0017	NA	--	0.0017
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.95	NA	--	0.95
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0066	NA	--	0.0066
			Benzene	2E-10	NA	--	2E-10	Benzene	Hematopoietic	0.000068	NA	--	0.000068
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.000058	NA	0.000025	0.000083
			PCBs	1E-9	NA	9E-10	2E-9	PCBs	Immunologic	0.0018	NA	0.00081	0.0026
			(Total)	2E-8		5E-9	3E-8	(Total)		0.99		0.0012	0.99
			Total Risk Across All Media and Exposure Routes:				**3E-8**	Total Hazard Index Across All Media and Exposure Routes:					**0.99**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0017
Total immune HI=	0.95
Total kidney HI=	0.0011
Total liver HI=	0.0066
Total cardiovascular HI=	0.0035
Total body/organ weight HI=	0.000083
Total blood HI=	0.000068
Total other HI=	0.022

Table 9.7.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Undeveloped Area Subsurface Soil (1-20 ft depth)	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0028	NA	--	0.0028
			Arsenic	4E-8	NA	8E-9	5E-8	Arsenic	Skin/vascular	0.0061	NA	0.00060	0.0067
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0026	NA	--	0.0026
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.00073	NA	0.000048	0.00078
			Chromium	--	NA	--	--	Chromium	ND	0.049	NA	--	0.049
			Copper	--	NA	--	--	Copper	ND	0.0037	NA	--	0.0037
			Manganese	--	NA	--	--	Manganese	CNS	0.0077	NA	--	0.0077
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.24	NA	--	0.24
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000073	NA	--	0.0000073
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00039	NA	--	0.00039
			Selenium	--				Selenium	Selenosis: liver, CNS, skin	0.00015	NA	--	0.00015
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00048	NA	--	0.00048
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0051	NA	--	0.0051
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0029	NA	--	0.0029
			Zinc	--	NA	--	--	Zinc	Blood	0.0024	NA	--	0.0024
			Carbazole	1E-10	NA	7E-11	2E-10	Carbazole	ND	--	NA	--	--
			Dibenzofuran	--	NA	--	--	Dibenzofuran	ND	0.00022	NA	0.000073	0.00030
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.0000093	NA	--	0.0000093
			Xylene	--	NA			Xylene	Hyperactivity, body weight, mortality	0.000015	NA	--	0.000015
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.000058	NA	0.000025	0.000083
			Benz[a]anthracene	2E-8	NA	2E-8	3E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-7	NA	1E-7	3E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-8	NA	2E-8	3E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Benzo[ghi]perylene	--	NA	--	--	Benzo[ghi]perylene	Body weight	0.000014	NA	0.0000062	0.000021
			Benzo[k]fluoranthene	3E-10	NA	2E-10	5E-10	Benzo[k]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	3E-9	NA	2E-9	5E-9	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-9	NA	2E-9	5E-9	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.000029	NA	0.000013	0.000042
			PCBs	1E-8	NA	1E-8	2E-8	PCBs	Immunologic	0.022	NA	0.0099	0.031
			(Total)	2E-7		2E-7	4E-7	(Total)		0.34		0.011	0.35
			Total Risk Across All Media and Exposure Routes:				**4E-7**		Total Hazard Index Across All Media and Exposure Routes:				**0.35**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0077
Total immune HI=	0.27
Total kidney HI =	0.0034
Total liver HI=	0.0051
Total cardiovascular HI =	0.0067
Total body/organ weight HI=	0.00054
Total blood HI =	0.0054
Total other HI=	0.056

Table 9.8.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0040	NA	--	0.0040
			Arsenic	2E-7	NA	8E-9	3E-7	Arsenic	Skin/vascular	0.0042	NA	0.00014	0.0044
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0093	NA	--	0.0093
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.00082	NA	0.000019	0.00084
			Chromium	--	NA	--	--	Chromium	ND	0.12	NA	--	0.12
			Copper	--	NA	--	--	Copper	ND	0.00088	NA	--	0.00088
			Manganese	--	NA	--	--	Manganese	CNS	0.0014	NA	--	0.0014
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.077	NA	--	0.077
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00041	NA	--	0.00041
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00032	NA	--	0.00032
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00056	NA	--	0.00056
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.016	NA	--	0.016
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0010	NA	--	0.0010
			Zinc	--	NA	--	--	Zinc	Blood	0.010	NA	--	0.010
			Bis[2-ethylhexyl]phthalate	4E-8	NA	5E-9	5E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0012	NA	0.00014	0.0014
			Benz[a]anthracene	3E-8	NA	4E-9	3E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	5E-8	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-8	NA	6E-9	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-7	NA	2E-8	1E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	3E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--		--		Napthalene	Body weight	0.00031		0.000046	0.00036
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00020	NA	0.000030	0.00023
			PCBs	1E-7	NA	2E-8	2E-7	PCBs	Immunologic	0.028	NA	0.0045	0.032
			(Total)	1E-6		1E-7	1E-6	(Total)		0.28		0.0048	0.28
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	2E-7	NA	7E-9	2E-7	Arsenic	Skin/vascular	0.0037	NA	0.00013	0.0039
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000026	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.0066	NA	--	0.0066
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.55	NA	--	0.55
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00016	NA	--	0.00016
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0076	NA	--	0.0076
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00098	NA	--	0.00098
			Zinc	--	NA	--	--	Zinc	Blood	0.0015	NA	--	0.0015
			Benz[a]anthracene	2E-8	NA	3E-9	2E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-7	NA	3E-8	2E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-8	NA	3E-9	2E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-8	NA	6E-9	4E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-8	NA	2E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	2E-8	NA	4E-9	3E-8	PCBs	Immunologic	0.0046	NA	0.00074	0.0054
			(Total)	5E-7		5E-8	6E-7	(Total)		0.57		0.00090	0.57
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00014	NA	0.0016	0.0017
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.00090	NA	0.0061	0.0070
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000042	NA	0.00000020	0.00000062
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0010		0.0077	0.0087
			Total Risk Across All Media and Exposure Routes:				**2E-6**	Total Hazard Index Across All Media and Exposure Routes:					**0.86**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0037
Total immune HI=	0.67
Total kidney HI=	0.011
Total liver HI=	0.024
Total cardiovascular HI=	0.0082
Total body/organ weight HI=	0.0023
Total blood HI=	0.014
Total other HI=	0.13

Table 9.9.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0058	NA	--	0.0058
			Arsenic	3E-7	NA	3E-8	4E-7	Arsenic	Skin/vascular	0.0060	NA	0.00058	0.0066
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.013	NA	--	0.013
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000075	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.17	NA	--	0.17
			Copper	--	NA	--	--	Copper	ND	0.0013	NA	--	0.0013
			Manganese	--	NA	--	--	Manganese	CNS	0.0020	NA	--	0.0020
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.11	NA	--	0.11
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00059	NA	--	0.00059
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00045	NA	--	0.00045
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00080	NA	--	0.00080
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.023	NA	--	0.023
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.015	NA	--	0.015
			Bis[2-ethylhexyl]phthalate	6E-8	NA	2E-8	8E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0017	NA	0.00056	0.0023
			Benz[a]anthracene	4E-8	NA	2E-8	6E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-7	NA	2E-7	7E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-8	NA	2E-8	8E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	6E-8	2E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-8	NA	1E-8	4E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.00045	NA	0.00019	0.00063
			2-Methlynapthalene	--		--		2-Methlynapthalene	Body weight	0.00029		0.00012	0.00041
			PCBs	2E-7	NA	9E-8	3E-7	PCBs	Immunologic	0.040	NA	0.018	0.058
			(Total)	1E-6		5E-7	2E-6	(Total)		0.39		0.019	0.41
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-7	NA	3E-8	3E-7	Arsenic	Skin/vascular	0.0053	NA	0.00051	0.0058
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0017	NA	0.00011	0.0018
			Chromium	--	NA	--	--	Chromium	ND	0.0094	NA	--	0.0094
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.78	NA	--	0.78
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00023	NA	--	0.00023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.011	NA	--	0.011
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.0021	NA	--	0.0021
			Benz[a]anthracene	3E-8	NA	1E-8	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	1E-7	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-8	NA	1E-8	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-8	NA	2E-8	8E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	9E-9	3E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-8	NA	2E-8	5E-8	PCBs	Immunologic	0.0066	NA	0.0030	0.0096
			(Total)	8E-7		2E-7	1E-6	(Total)		0.82		0.0036	0.82
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00019	NA	0.0016	0.0018
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0013	NA	0.0061	0.0074
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000060	NA	0.00000020	0.00000081
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0015		0.0077	0.0092
			Total Risk Across All Media and Exposure Routes:				**3E-6**	Total Hazard Index Across All Media and Exposure Routes:					**1.2**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0046
Total immune HI=	0.97
Total kidney HI=	0.016
Total liver HI=	0.034
Total cardiovascular HI=	0.012
Total body/organ weight HI=	0.0038
Total blood HI=	0.019
Total other HI=	0.19

Table 9.10.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0040	NA	--	0.0040
			Arsenic	2E-7	NA	8E-9	3E-7	Arsenic	Skin/vascular	0.0042	NA	0.00014	0.0044
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0093	NA	--	0.0093
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.00082	NA	0.000019	0.00084
			Chromium	--	NA	--	--	Chromium	ND	0.12	NA	--	0.12
			Copper	--	NA	--	--	Copper	ND	0.00088	NA	--	0.00088
			Manganese	--	NA	--	--	Manganese	CNS	0.0014	NA	--	0.0014
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	1.7	NA	--	1.7
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00041	NA	--	0.00041
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00032	NA	--	0.00032
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00056	NA	--	0.00056
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.016	NA	--	0.016
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00097	NA	--	0.00097
			Zinc	--	NA	--	--	Zinc	Blood	0.010	NA	--	0.010
			Bis[2-ethylhexyl]phthalate	4E-8	NA	5E-9	5E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0012	NA	0.00014	0.0014
			Benz[a]anthracene	3E-8	NA	4E-9	3E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	5E-8	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-8	NA	6E-9	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-7	NA	2E-8	1E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	3E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--				Napthalene	Body weight	0.00031		0.000046	0.00036
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00020	NA	0.000030	0.00023
			PCBs	1E-7	NA	2E-8	2E-7	PCBs	Immunologic	0.028	NA	0.0045	0.032
			(Total)	1E-6		1E-7	1E-6	(Total)		1.9		0.0048	1.9
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	2E-7	NA	7E-9	2E-7	Arsenic	Skin/vascular	0.0037	NA	0.00013	0.0039
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000026	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.0066	NA	--	0.0066
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.55	NA	--	0.55
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00016	NA	--	0.00016
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0076	NA	--	0.0076
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00098	NA	--	0.00098
			Zinc	--	NA	--	--	Zinc	Blood	0.0015	NA	--	0.0015
			Benz[a]anthracene	2E-8	NA	3E-9	2E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-7	NA	3E-8	2E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-8	NA	3E-9	2E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-8	NA	6E-9	4E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-8	NA	2E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	2E-8	NA	4E-9	3E-8	PCBs	Immunologic	0.0046	NA	0.00074	0.0054
			(Total)	5E-7		5E-8	6E-7	(Total)		0.57		0.00090	0.57
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00014	NA	0.0016	0.0017
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.00090	NA	0.0061	0.0070
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000042	NA	0.00000020	0.00000062
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0010		0.0077	0.0087
			Total Risk Across All Media and Exposure Routes:				**2E-6**	Total Hazard Index Across All Media and Exposure Routes:					**2.5**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0037
Total immune HI=	2.3
Total kidney HI=	0.011
Total liver HI=	0.024
Total cardiovascular HI=	0.0082
Total body/organ weight HI=	0.0023
Total blood HI=	0.014
Total other HI=	0.13

Table 9.11.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0058	NA	--	0.0058
			Arsenic	3E-7	NA	3E-8	4E-7	Arsenic	Skin/vascular	0.0060	NA	0.00058	0.0066
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.013	NA	--	0.013
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000075	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.17	NA	--	0.17
			Copper	--	NA	--	--	Copper	ND	0.0013	NA	--	0.0013
			Manganese	--	NA	--	--	Manganese	CNS	0.0020	NA	--	0.0020
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	2.4	NA	--	2.4
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00059	NA	--	0.00059
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00045	NA	--	0.00045
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00080	NA	--	0.00080
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.023	NA	--	0.023
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.015	NA	--	0.015
			Bis[2-ethylhexyl]phthalate	6E-8	NA	2E-8	8E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0017	NA	0.00056	0.0023
			Benz[a]anthracene	4E-8	NA	2E-8	6E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-7	NA	2E-7	7E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-8	NA	2E-8	8E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	6E-8	2E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-8	NA	1E-8	4E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.00045	NA	0.00019	0.00063
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00029	NA	0.00012	0.00041
			PCBs	2E-7	NA	9E-8	3E-7	PCBs	Immunologic	0.040	NA	0.018	0.058
			(Total)	1E-6		5E-7	2E-6	(Total)		2.7		0.019	2.8
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-7	NA	3E-8	3E-7	Arsenic	Skin/vascular	0.0053	NA	0.00051	0.0058
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0017	NA	0.00011	0.0018
			Chromium	--	NA	--	--	Chromium	ND	0.0094	NA	--	0.0094
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.78	NA	--	0.78
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00023	NA	--	0.00023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.011	NA	--	0.011
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.0021	NA	--	0.0021
			Benz[a]anthracene	3E-8	NA	1E-8	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	1E-7	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-8	NA	1E-8	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-8	NA	2E-8	8E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	9E-9	3E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-8	NA	2E-8	5E-8	PCBs	Immunologic	0.0066	NA	0.0030	0.0096
			(Total)	8E-7		2E-7	1E-6	(Total)		0.82		0.0036	0.82
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00019	NA	0.0016	0.0018
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0013	NA	0.0061	0.0074
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000060	NA	0.00000020	0.00000081
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0015		0.0077	0.0092
			Total Risk Across All Media and Exposure Routes:				**3E-6**	Total Hazard Index Across All Media and Exposure Routes:					**3.6**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0046
Total immune HI=	3.3
Total kidney HI=	0.016
Total liver HI=	0.034
Total cardiovascular HI=	0.012
Total body/organ weight HI=	0.0038
Total blood HI=	0.019
Total other HI=	0.19

Table 9.12.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	8E-7	NA	8E-7	Benzene	Hematopoietic	NA	0.026	NA	0.026
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0021	NA	0.0021
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000011	NA	0.000011
			1,4-Dichlorobenzene	NA	4E-8	NA	4E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000065	NA	0.000065
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0042	NA	0.0042
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	0.021	NA	0.021
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.023	NA	0.023
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.021	NA	0.021
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.19	NA	0.19
			(Total)	NA	8E-7	NA	8E-7	(Total)		NA	0.29	NA	0.29
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	3E-5	NA	1E-7	3E-5	Arsenic	Skin/vascular	0.60	NA	0.0019	0.60
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.12	NA	0.0053	0.12
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.11	NA	0.014	0.12
			Copper	--	NA	--	--	Copper	ND	0.046	NA	0.00015	0.046
			Manganese	--	NA	--	--	Manganese	CNS	0.79	NA	0.063	0.85
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.2	NA	0.056	1.3
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0020	NA	0.0000065	0.0020
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.040	NA	0.00032	0.041
			Thallium	--	NA	--	--	Thallium	Liver enzymes	1.4	NA	0.0044	1.4
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.10	NA	0.012	0.11
			Benzene	8E-6	NA	5E-7	9E-6	Benzene	Hematopoietic	0.29	NA	0.019	0.31
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0094	NA	0.0012	0.011
			Chloroethane	6E-8	NA	2E-9	--	Chloroethane	ND	0.00042	NA	0.000011	0.00043
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.022	NA	0.000091	0.022
			1,4-Dichlorobenzene	2E-7	NA	5E-8	3E-7	1,4-Dichlorobenzene	ND	0.0026	NA	0.00051	0.0031
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.11	NA	0.0015	0.11
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.068	NA	0.0099	0.078
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.016	NA	0.0041	0.020
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0048	NA	0.0011	0.0059
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.043	NA	0.0094	0.052
			(Total)	4E-5		7E-7	4E-5	(Total)		4.9		0.20	5.1
			Total Risk Across All Media and Exposure Routes:				**4E-05**		Total Risk Across All Media and Exposure Routes:				**5.4**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.92
Total immune HI=	1.3
Total kidney HI=	0.24
Total liver HI=	1.4
Total cardiovascular HI =	0.60
Total body/organ weight HI =	0.37
Total blood HI =	0.45
Total other HI =	0.19

Table 9.13.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.047	NA	0.047
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0039	NA	0.0039
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000021	NA	0.000021
			1,4-Dichlorobenzene	NA	5E-8	NA	5E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.00012	NA	0.00012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0077	NA	0.0077
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	0.038	NA	0.038
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.042	NA	0.042
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.039	NA	0.039
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.35	NA	0.35
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.53	NA	0.53
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	6E-5	NA	2E-7	6E-5	Arsenic	Skin/vascular	0.13	NA	0.0044	0.13
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.024	NA	0.012	0.036
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.023	NA	0.031	0.054
			Copper	--	NA	--	--	Copper	ND	0.0098	NA	0.00033	0.010
			Manganese	--	NA	--	--	Manganese	CNS	0.17	NA	0.14	0.31
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.26	NA	0.13	0.38
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00043	NA	0.000015	0.00044
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0085	NA	0.00073	0.0092
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.29	NA	0.0099	0.30
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.021	NA	0.028	0.049
			Benzene	1E-5	NA	8E-7	1E-5	Benzene	Hematopoietic	0.061	NA	0.044	0.10
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0020	NA	0.0028	0.0048
			Chloroethane	1E-7	NA	2E-9	--	Chloroethane	ND	0.000088	NA	0.000024	0.00011
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0046	NA	0.00021	0.0048
			1,4-Dichlorobenzene	4E-7	NA	7E-8	5E-7	1,4-Dichlorobenzene	ND	0.00054	NA	0.0012	0.0017
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.023	NA	0.0034	0.026
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.014	NA	0.022	0.037
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0033	NA	0.0092	0.012
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0010	NA	0.0024	0.0034
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0090	NA	0.021	0.030
			(Total)	7E-5		1E-6	7E-5	(Total)		1.0		0.46	1.5
			Total Risk Across All Media and Exposure Routes:				**7E-05**		Total Risk Across All Media and Exposure Routes:				**2.0**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.40
Total immune HI=	0.38
Total kidney HI=	0.090
Total liver HI=	0.31
Total cardiovascular HI =	0.13
Total body/organ weight HI =	0.43
Total blood HI =	0.20
Total other HI =	0.088

Table 10.1.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.017		0.017
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	2E-5	NA	2E-5	Benzene	Hematopoietic	NA	0.29	NA	0.29
			(Total)	NA	2E-5	NA	2E-5	(Total)			0.29		0.29
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.014	NA	0.014
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00064	NA	0.00064
			Chloroethane	NA	9E-8	NA	9E-8	Chloroethane	ND	NA	0.000031	NA	0.000031
			1,4-Dichlorobenzene	NA	2E-8	NA	2E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000012	NA	0.000012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0025	NA	0.0025
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.014	NA	0.014
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.010	NA	0.010
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.015	NA	0.015
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.056	NA	0.056
Surface Soil	Surface Soil	Developed Area Surface Soil (unpaved)	Arsenic	3.E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.018	NA	0.0071	0.025
			Chromium	--	NA	--	--	Chromium	ND	0.016	NA	--	0.016
			Copper	--	NA	--	--	Copper	ND	0.0057	NA	--	0.0057
			Manganese	--	NA	--	--	Manganese	CNS	0.0057	NA	--	0.0057
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.51	NA	--	0.51
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0076	NA	--	0.0076
			Benzo[a]pyrene	5.E-7	NA	9E-7	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1.E-7	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	9.E-8	NA	2E-7	2E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	4E-6		2E-6	6E-6	(Total)		0.56		0.0071	0.57
			Total Risk Across All Media and Exposure Routes:				**3E-5**	Total Hazard Index Across All Media and Exposure Routes:					**0.93**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.046
Total immune HI=	0.51
Total kidney HI=	--
Total cardiovascular HI=	0.025
Total body/organ weight HI=	0.015
Total blood HI=	0.31
Total other HI=	0.025

Table 10.2.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.017		0.017
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	2E-5	NA	2E-5	Benzene	Hematopoietic	NA	0.29	NA	0.29
			(Total)	NA	2E-5	NA	2E-5	(Total)			0.29		0.29
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.014	NA	0.014
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00064	NA	0.00064
			Chloroethane	NA	9E-8	NA	9E-8	Chloroethane	ND	NA	0.000031	NA	0.000031
			1,4-Dichlorobenzene	NA	2E-8	NA	2E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000012	NA	0.000012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0025	NA	0.0025
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.014	NA	0.014
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.010	NA	0.010
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.015	NA	0.015
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.056	NA	0.056
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	2.E-6	NA	6E-7	2E-6	Arsenic	Skin/vascular	0.010	NA	0.0040	0.014
			Chromium	--	NA	--	--	Chromium	ND	0.012	NA	--	0.012
			Copper	--	NA	--	--	Copper	ND	0.077	NA	--	0.077
			Manganese	--	NA	--	--	Manganese	CNS	0.0036	NA	--	0.0036
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	2.1	NA	--	2.1
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.017	NA	--	0.017
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0076	NA	--	0.0076
			Benzene	3.E-8	NA	--	3E-8	Benzene	Hematopoietic	0.00034	NA	--	0.00034
			Benz[a]anthracene	1.E-7	NA	2E-7	3E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	7.E-7	NA	1E-6	2E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	9.E-8	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2.E-7	NA	3E-7	5E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	3E-6		3E-6	5E-6	(Total)		2.3		0.0040	2.3

Table 10.2.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	--	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
			Total Risk Across All Media and Exposure Routes:				**9E-5**		Total Hazard Index Across All Media and Exposure Routes:				**5.2**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.46
Total immune HI=	2.8
Total kidney HI=	0.11
Total liver HI=	0.72
Total cardiovascular HI=	0.32
Total body/organ weight HI=	0.094
Total blood HI=	0.51
Total other HI=	0.18

Table 10.3.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.017		0.017
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	2E-5	NA	2E-5	Benzene	Hematopoietic	NA	0.29	NA	0.29
			(Total)	NA	2E-5	NA	2E-5	(Total)			0.29		0.29
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.014	NA	0.014
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00064	NA	0.00064
			Chloroethane	NA	9E-8	NA	9E-8	Chloroethane	ND	NA	0.000031	NA	0.000031
			1,4-Dichlorobenzene	NA	2E-8	NA	2E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000012	NA	0.000012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0025	NA	0.0025
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.014	NA	0.014
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.010	NA	0.010
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.015	NA	0.015
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.056	NA	0.056
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	2.E-6	NA	6E-7	2E-6	Arsenic	Skin/vascular	0.010	NA	0.0040	0.014
			Chromium	--	NA	--	--	Chromium	ND	0.012	NA	--	0.012
			Copper	--	NA	--	--	Copper	ND	0.077	NA	--	0.077
			Manganese	--	NA	--	--	Manganese	CNS	0.0036	NA	--	0.0036
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	0.63	NA	--	0.63
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.017	NA	--	0.017
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0076	NA	--	0.0076
			Benzene	3.E-8	NA	--	3E-8	Benzene	Hematopoietic	0.00034	NA	--	0.00034
			Benz[a]anthracene	--	NA	2E-7	2E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	--	NA	1E-6	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3.E-6	NA	2E-7	3E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	--	NA	3E-7	3E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	4E-6		3E-6	7E-6	(Total)		0.76		0.0040	0.76

Table 10.3.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	9E-8	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
						Total Risk Across All Media and Exposure Routes:	**9E-5**					Total Hazard Index Across All Media and Exposure Routes:	**3.6**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.46
Total immune HI=	1.3
Total kidney HI=	0.11
Total liver HI=	0.72
Total cardiovascular HI=	0.32
Total body/organ weight HI=	0.094
Total blood HI=	0.51
Total other HI=	0.18

Table 10.4.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			Chromium IV particulates	NA	2E-6	NA	2E-6	Chromium IV particulates	Lung	NA	0.0048	NA	0.0048
			(Total)		2E-6		2E-6	(Total)			0.022		0.022
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	9E-11	NA	9E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000003	NA	0.00000003
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.12	NA	0.12
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.76	NA	0.76
			Benz[a]anthracene	NA	1E-7	NA	1E-7	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	1E-6	NA	1E-6	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	1E-7	NA	1E-7	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00042	NA	0.00042
			Benzo[k]fluoranthene	NA	8E-9	NA	8E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	8E-8	NA	8E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-7	NA	1E-7	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	4.8	NA	4.8
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	5.7	NA	5.7
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	2E-6	NA	2E-6	Benzene	Hematopoietic	NA	0.024	NA	0.024
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0011	NA	0.0011
			Chloroethane	NA	2E-7	NA	2E-7	Chloroethane	ND	NA	0.000051	NA	0.000051
			1,4-Dichlorobenzene	NA	4E-8	NA	4E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000020	NA	0.000020
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0042	NA	0.0042
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.023	NA	0.023
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.017	NA	0.017
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.025	NA	0.025
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	0.094	NA	0.094
Surface Soil	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.016	NA	0.0064	0.023
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.036	NA	--	0.036
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0032	NA	0.00083	0.0040
			Chromium	--	NA	--	--	Chromium	ND	0.46	NA	--	0.46
			Copper	--	NA	--	--	Copper	ND	0.0034	NA	--	0.0034
			Manganese	--	NA	--	--	Manganese	CNS	0.0054	NA	--	0.0054
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.30	NA	--	0.30
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0016	NA	--	0.0016
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0012	NA	--	0.0012
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0022	NA	--	0.0022
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.062	NA	--	0.062
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0037	NA	--	0.0037
			Zinc	--	NA	--	--	Zinc	Blood	0.039	NA	--	0.039
			Bis[2-ethylhexyl]phthalate	5E-7	NA	6E-7	1E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0047	NA	0.0062	0.011
			Benz[a]anthracene	3E-7	NA	5E-7	8E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	4E-6	NA	6E-6	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-7	NA	7E-7	1E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	2E-6	3E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0012	NA	0.0021	0.0033
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00077	NA	0.0013	0.0021
			PCBs	2E-6	NA	3E-6	4E-6	PCBs	Immunologic	0.11	NA	0.20	0.31
			(Total)	1E-5		1E-5	2E-5	(Total)		1.1		0.22	1.3

Table 10.4.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	--	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
			Total Risk Across All Media and Exposure Routes:				**9E-5**		Total Hazard Index Across All Media and Exposure Routes:				**9.6**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	1.4
Total immune HI=	1.2
Total kidney HI=	0.15
Total liver HI=	0.77
Total cardiovascular HI=	0.33
Total body/organ weight HI=	5.0
Total blood HI=	0.26
Total other HI=	0.6

Table 10.5.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.017	NA	0.017
			Chromium IV particulates	NA	2E-6	NA	2E-6	Chromium IV particulates	Lung	NA	0.0048	NA	0.0048
			(Total)		2E-6		2E-6	(Total)			0.022		0.022
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	9E-11	NA	9E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000003	NA	0.00000003
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.12	NA	0.12
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.76	NA	0.76
			Benz[a]anthracene	NA	1E-7	NA	1E-7	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	1E-6	NA	1E-6	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	1E-7	NA	1E-7	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00042	NA	0.00042
			Benzo[k]fluoranthene	NA	8E-9	NA	8E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	8E-8	NA	8E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-7	NA	1E-7	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	4.8	NA	4.8
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	5.7	NA	5.7
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	2E-6	NA	2E-6	Benzene	Hematopoietic	NA	0.024	NA	0.024
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0011	NA	0.0011
			Chloroethane	NA	2E-7	NA	2E-7	Chloroethane	ND	NA	0.000051	NA	0.000051
			1,4-Dichlorobenzene	NA	4E-8	NA	4E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000020	NA	0.000020
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0042	NA	0.0042
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.023	NA	0.023
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.017	NA	0.017
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.025	NA	0.025
			(Total)	NA	2E-6	NA	2E-6	(Total)		NA	0.094	NA	0.094
Surface Soil	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.016	NA	0.0064	0.023
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.036	NA	--	0.036
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0032	NA	0.00083	0.0040
			Chromium	--	NA	--	--	Chromium	ND	0.46	NA	--	0.46
			Copper	--	NA	--	--	Copper	ND	0.0034	NA	--	0.0034
			Manganese	--	NA	--	--	Manganese	CNS	0.0054	NA	--	0.0054
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	13	NA	--	13
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0016	NA	--	0.0016
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0012	NA	--	0.0012
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0022	NA	--	0.0022
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.062	NA	--	0.062
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0037	NA	--	0.0037
			Zinc	--	NA	--	--	Zinc	Blood	0.039	NA	--	0.039
			Bis[2-ethylhexyl]phthalate	5E-7	NA	6E-7	1E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0047	NA	0.0062	0.011
			Benz[a]anthracene	3E-7	NA	5E-7	8E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	4E-6	NA	6E-6	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-7	NA	7E-7	1E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	2E-6	3E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0012	NA	0.0021	0.0033
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00077	NA	0.0013	0.0021
			PCBs	2E-6	NA	3E-6	4E-6	PCBs	Immunologic	0.11	NA	0.20	0.31
			(Total)	1E-5		1E-5	2E-5	(Total)		14		0.22	14

Table 10.5.RME (continued)
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-5	NA	1E-9	5E-5	Arsenic	Skin/vascular	0.31	NA	0.0000081	0.31
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.059	NA	0.000022	0.059
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.055	NA	0.000058	0.055
			Copper	--	NA	--	--	Copper	ND	0.024	NA	0.00000062	0.024
			Manganese	--	NA	--	--	Manganese	CNS	0.40	NA	0.00027	0.40
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.62	NA	0.00023	0.62
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0010	NA	0.000000027	0.0010
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.021	NA	0.0000014	0.021
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.69	NA	0.000018	0.69
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.051	NA	0.000052	0.051
			Benzene	1E-5	NA	6E-9	1E-5	Benzene	Hematopoietic	0.15	NA	0.000081	0.15
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0048	NA	0.0000052	0.0048
			Chloroethane	9E-8	NA	2E-11	--	Chloroethane	ND	0.00021	NA	0.000000045	0.00021
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.011	NA	0.00000038	0.011
			1,4-Dichlorobenzene	3E-7	NA	5E-10	3E-7	1,4-Dichlorobenzene	ND	0.0013	NA	0.0000021	0.0013
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.056	NA	0.0000063	0.056
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.035	NA	0.000041	0.035
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0080	NA	0.000017	0.0081
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0024	NA	0.0000045	0.0025
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.022	NA	0.000040	0.022
			(Total)	6E-5		8E-9	6E-5	(Total)		2.5		0.00086	2.5
						Total Risk Across All Media and Exposure Routes:	**9E-5**					Total Hazard Index Across All Media and Exposure Routes:	**23**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	1.4
Total immune HI=	14
Total kidney HI=	0.15
Total liver HI=	0.77
Total cardiovascular HI=	0.33
Total body/organ weight HI=	5.0
Total blood HI=	0.26
Total other HI=	0.57

Table 10.6.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/ Future
Receptor Population: Construction Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Developed Area Subsurface Soil (1-20 ft depth)	Arsenic	3E-7	NA	2E-8	3E-7	Arsenic	Skin/vascular	0.026	NA	0.0015	0.027
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0091	NA	--	0.0091
			Chromium	--	NA	--	--	Chromium	ND	0.034	NA	--	0.034
			Copper	--	NA	--	--	Copper	ND	0.14	NA	--	0.14
			Manganese	--	NA	--	--	Manganese	CNS	0.013	NA	--	0.013
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	7.5	NA	--	7.5
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.052	NA	--	0.052
			Benzene	3E-9	NA	--	3E-9	Benzene	Hematopoietic	0.00054	NA	--	0.00054
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00046	NA	0.00012	0.00058
			PCBs	2E-8	NA	4E-9	2E-8	PCBs	Immunologic	0.014	NA	0.0039	0.018
			(Total)	3E-7		2E-8	4E-7	(Total)		7.8		0.0056	7.8
			Total Risk Across All Media and Exposure Routes:				**4E-7**	Total Hazard Index Across All Media and Exposure Routes:					**7.8**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.013
Total immune HI=	7.5
Total kidney HI=	0.0091
Total liver HI=	0.052
Total cardiovascular HI=	0.027
Total body/organ weight HI=	0.00058
Total blood HI=	0.00054
Total other HI=	0.18

Table 10.7.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Undeveloped Area Subsurface Soil (1-20 ft depth)	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.022	NA	--	0.022
			Arsenic	6E-7	NA	4E-8	7E-7	Arsenic	Skin/vascular	0.048	NA	0.0029	0.051
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.021	NA	--	0.021
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0058	NA	0.00023	0.0060
			Chromium	--	NA	--	--	Chromium	ND	0.38	NA	--	0.38
			Copper	--	NA	--	--	Copper	ND	0.029	NA	--	0.029
			Manganese	--	NA	--	--	Manganese	CNS	0.061	NA	--	0.061
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.9	NA	--	1.9
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.000058	NA	--	0.000058
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0031	NA	--	0.0031
			Selenium					Selenium	Selenosis: liver, CNS, skin	0.0012	NA	--	0.0012
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0038	NA	--	0.0038
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.040	NA	--	0.040
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.023	NA	--	0.023
			Zinc	--	NA	--	--	Zinc	Blood	0.019	NA	--	0.019
			Carbazole	2E-9	NA	3E-10	2E-9	Carbazole	ND	--	NA	--	--
			Dibenzofuran	--	NA	--	--	Dibenzofuran	ND	0.0018	NA	0.00035	0.0021
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.00012	NA	--	0.00012
			Xylene	--	NA			Xylene	Hyperactivity, body weight, mortality	0.00012	NA	--	0.00012
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00046	NA	0.00012	0.00058
			Benz[a]anthracene	3E-7	NA	8E-8	4E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-6	NA	6E-7	3E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-7	NA	8E-8	4E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Benzo[k]fluoranthene	4E-9	NA	1E-9	5E-9	Benzo[k]fluoranthene	ND	--	NA	--	--
			Benzo[ghi]perylene	--	NA	--	--	Benzo[ghi]perylene	Body weight	0.00011	NA	0.000030	0.00014
			Dibenz[a,h]anthracene	4E-8	NA	1E-8	5E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	5E-8	NA	1E-8	6E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.00023	NA	0.000060	0.00029
			PCBs	2E-7	NA	5E-8	2E-7	PCBs	Immunologic	0.17	NA	0.048	0.22
			(Total)	4E-6		9E-7	5E-6	(Total)		2.7		0.051	2.8
			Total Risk Across All Media and Exposure Routes:				**5E-6**		Total Hazard Index Across All Media and Exposure Routes:				**2.8**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.061
Total immune HI=	2.1
Total kidney HI =	0.027
Total liver HI=	0.040
Total cardiovascular HI =	0.05
Total body/organ weight HI=	0.0041
Total blood HI =	0.043
Total other HI=	0.44

Table 10.8.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	2E-6	5E-6	Arsenic	Skin/vascular	0.017	NA	0.0088	0.026
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.038	NA	--	0.038
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0033	NA	0.0011	0.0045
			Chromium	--	NA	--	--	Chromium	ND	0.49	NA	--	0.49
			Copper	--	NA	--	--	Copper	ND	0.0036	NA	--	0.0036
			Manganese	--	NA	--	--	Manganese	CNS	0.0057	NA	--	0.0057
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.31	NA	--	0.31
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0017	NA	--	0.0017
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0013	NA	--	0.0013
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0023	NA	--	0.0023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.065	NA	--	0.065
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0039	NA	--	0.0039
			Zinc	--	NA	--	--	Zinc	Blood	0.041	NA	--	0.041
			Bis[2-ethylhexyl]phthalate	6E-7	NA	1E-6	2E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0050	NA	0.0085	0.0134
			Benz[a]anthracene	4E-7	NA	9E-7	1E-6	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-6	NA	1E-5	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-7	NA	1E-6	2E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	3E-6	5E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-7	NA	6E-7	9E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--				Napthalene	Body weight	0.0013		0.0028	0.0041
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00082	NA	0.0018	0.0026
			PCBs	2E-6	NA	5E-6	7E-6	PCBs	Immunologic	0.11	NA	0.27	0.39
			(Total)	1E-5		2E-5	4E-5	(Total)		1.1		0.30	1.4
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.015	NA	0.0078	0.023
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0047	NA	0.0016	0.0063
			Chromium	--	NA	--	--	Chromium	ND	0.027	NA	--	0.027
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	2.2	NA	--	2.2
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00065	NA	--	0.00065
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.031	NA	--	0.031
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0040	NA	--	0.0040
			Zinc	--	NA	--	--	Zinc	Blood	0.0061	NA	--	0.0061
			Benz[a]anthracene	3E-7	NA	6E-7	9E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-6	NA	6E-6	8E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-7	NA	6E-7	9E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-7	NA	8E-7	1E-6	PCBs	Immunologic	0.019	NA	0.045	0.064
			(Total)	7E-6		1E-5	2E-5	(Total)		2.3		0.055	2.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00055	NA	0.0065	0.0071
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0036	NA	0.025	0.028
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000017	NA	0.00000082	0.0000025
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0042		0.031	0.035
			Total Risk Across All Media and Exposure Routes:				**5E-5**	Total Hazard Index Across All Media and Exposure Routes:					**3.8**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.015
Total immune HI=	3.0
Total kidney HI=	0.049
Total liver HI=	0.096
Total cardiovascular HI=	0.049
Total body/organ weight HI=	0.021
Total blood HI=	0.055
Total other HI=	0.54

Table 10.9.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.023	NA	--	0.023
			Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.024	NA	0.0088	0.033
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.054	NA	--	0.054
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0048	NA	0.0011	0.0059
			Chromium	--	NA	--	--	Chromium	ND	0.69	NA	--	0.69
			Copper	--	NA	--	--	Copper	ND	0.0051	NA	--	0.0051
			Manganese	--	NA	--	--	Manganese	CNS	0.0081	NA	--	0.0081
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.45	NA	--	0.45
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0024	NA	--	0.0024
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0018	NA	--	0.0018
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0033	NA	--	0.0033
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.094	NA	--	0.094
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0056	NA	--	0.0056
			Zinc	--	NA	--	--	Zinc	Blood	0.059	NA	--	0.059
			Bis[2-ethylhexyl]phthalate	3E-7	NA	3E-7	6E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0071	NA	0.0085	0.016
			Benz[a]anthracene	2E-7	NA	3E-7	4E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-6	NA	3E-6	5E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-7	NA	3E-7	6E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-7	NA	2E-7	3E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.0018	NA	0.0028	0.0046
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.0012	NA	0.0018	0.0030
			PCBs	8E-7	NA	1E-6	2E-6	PCBs	Immunologic	0.16	NA	0.27	0.44
			(Total)	6E-6		7E-6	1E-5	(Total)		1.6		0.30	1.9
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.022	NA	0.0078	0.029
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0067	NA	0.0016	0.0083
			Chromium	--	NA	--	--	Chromium	ND	0.038	NA	--	0.038
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	3.2	NA	--	3.2
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00093	NA	--	0.00093
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.044	NA	--	0.044
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0057	NA	--	0.0057
			Zinc	--	NA	--	--	Zinc	Blood	0.0087	NA	--	0.0087
			Benz[a]anthracene	1E-7	NA	2E-7	3E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-6	3E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	3E-7	6E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	8E-8	NA	1E-7	2E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	1E-7	NA	2E-7	4E-7	PCBs	Immunologic	0.027	NA	0.045	0.072
			(Total)	3E-6		3E-6	6E-6	(Total)		3.3		0.055	3.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00078	NA	0.0065	0.0073
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0052	NA	0.025	0.030
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000025	NA	0.00000082	0.0000033
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0060		0.031	0.037
			Total Risk Across All Media and Exposure Routes:				**2E-5**	Total Hazard Index Across All Media and Exposure Routes:					**5.3**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.019
Total immune HI=	4.2
Total kidney HI=	0.068
Total liver HI=	0.14
Total cardiovascular HI=	0.063
Total body/organ weight HI=	0.025
Total blood HI=	0.079
Total other HI=	0.76

Table 10.10.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.016	NA	--	0.016
			Arsenic	3E-6	NA	2E-6	5E-6	Arsenic	Skin/vascular	0.017	NA	0.0088	0.026
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.038	NA	--	0.038
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0033	NA	0.0011	0.0045
			Chromium	--	NA	--	--	Chromium	ND	0.49	NA	--	0.49
			Copper	--	NA	--	--	Copper	ND	0.0036	NA	--	0.0036
			Manganese	--	NA	--	--	Manganese	CNS	0.0057	NA	--	0.0057
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	14	NA	--	14
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0017	NA	--	0.0017
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0013	NA	--	0.0013
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0023	NA	--	0.0023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.065	NA	--	0.065
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0039	NA	--	0.0039
			Zinc	--	NA	--	--	Zinc	Blood	0.041	NA	--	0.041
			Bis[2-ethylhexyl]phthalate	6E-7	NA	1E-6	2E-6	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0050	NA	0.0085	0.013
			Benz[a]anthracene	4E-7	NA	9E-7	1E-6	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-6	NA	1E-5	1E-5	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-7	NA	1E-6	2E-6	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-6	NA	3E-6	5E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-7	NA	6E-7	9E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--				Napthalene	Body weight	0.0013		0.0028	0.0041
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00082	NA	0.0018	0.0026
			PCBs	2E-6	NA	5E-6	7E-6	PCBs	Immunologic	0.11	NA	0.27	0.39
			(Total)	1E-5		2E-5	4E-5	(Total)		15		0.30	15
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-6	NA	1E-6	4E-6	Arsenic	Skin/vascular	0.015	NA	0.0078	0.023
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0047	NA	0.0016	0.0063
			Chromium	--	NA	--	--	Chromium	ND	0.027	NA	--	0.027
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	2.2	NA	--	2.2
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00065	NA	--	0.00065
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.031	NA	--	0.031
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0040	NA	--	0.0040
			Zinc	--	NA	--	--	Zinc	Blood	0.0061	NA	--	0.0061
			Benz[a]anthracene	3E-7	NA	6E-7	9E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-6	NA	6E-6	8E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-7	NA	6E-7	9E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-7	NA	4E-7	6E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-7	NA	8E-7	1E-6	PCBs	Immunologic	0.019	NA	0.045	0.064
			(Total)	7E-6		1E-5	2E-5	(Total)		2.3		0.055	2.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00055	NA	0.0065	0.0071
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0036	NA	0.025	0.028
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000017	NA	0.00000082	0.0000025
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0042		0.031	0.035
			Total Risk Across All Media and Exposure Routes:				**5E-5**	Total Hazard Index Across All Media and Exposure Routes:					**17**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.015
Total immune HI=	17
Total kidney HI=	0.049
Total liver HI=	0.096
Total cardiovascular HI=	0.049
Total body/organ weight HI=	0.021
Total blood HI=	0.055
Total other HI=	0.54

Table 10.11.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.1)
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.023	NA	--	0.023
			Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.024	NA	0.0088	0.033
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.054	NA	--	0.054
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0048	NA	0.0011	0.0059
			Chromium	--	NA	--	--	Chromium	ND	0.69	NA	--	0.69
			Copper	--	NA	--	--	Copper	ND	0.0051	NA	--	0.0051
			Manganese	--	NA	--	--	Manganese	CNS	0.0081	NA	--	0.0081
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	20	NA	--	20
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0024	NA	--	0.0024
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0018	NA	--	0.0018
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0033	NA	--	0.0033
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.094	NA	--	0.094
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0056	NA	--	0.0056
			Zinc	--	NA	--	--	Zinc	Blood	0.059	NA	--	0.059
			Bis[2-ethylhexyl]phthalate	3E-7	NA	3E-7	6E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0071	NA	0.0085	0.016
			Benz[a]anthracene	2E-7	NA	3E-7	4E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-6	NA	3E-6	5E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-7	NA	3E-7	6E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6E-7	NA	1E-6	2E-6	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-7	NA	2E-7	3E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.0018	NA	0.0028	0.0046
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.0012	NA	0.0018	0.0030
			PCBs	8E-7	NA	1E-6	2E-6	PCBs	Immunologic	0.16	NA	0.27	0.44
			(Total)	6E-6		7E-6	1E-5	(Total)		21		0.30	21
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	1E-6	NA	5E-7	2E-6	Arsenic	Skin/vascular	0.022	NA	0.0078	0.029
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0067	NA	0.0016	0.0083
			Chromium	--	NA	--	--	Chromium	ND	0.038	NA	--	0.038
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	3.2	NA	--	3.2
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00093	NA	--	0.00093
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.044	NA	--	0.044
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0057	NA	--	0.0057
			Zinc	--	NA	--	--	Zinc	Blood	0.0087	NA	--	0.0087
			Benz[a]anthracene	1E-7	NA	2E-7	3E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-6	3E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-7	3E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	3E-7	6E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	8E-8	NA	1E-7	2E-7	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	1E-7	NA	2E-7	4E-7	PCBs	Immunologic	0.027	NA	0.045	0.072
			(Total)	3E-6		3E-6	6E-6	(Total)		3.3		0.055	3.4
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00078	NA	0.0065	0.0073
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0052	NA	0.025	0.030
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000025	NA	0.00000082	0.0000033
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0060		0.031	0.037
			Total Risk Across All Media and Exposure Routes:				**2E-5**		Total Hazard Index Across All Media and Exposure Routes:				**25**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.019
Total immune HI=	24
Total kidney HI=	0.068
Total liver HI=	0.14
Total cardiovascular HI=	0.063
Total body/organ weight HI=	0.025
Total blood HI=	0.079
Total other HI=	0.76

Table 10.12.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	1E-4	NA	1E-4	Benzene	Hematopoietic	NA	1.4	NA	1.4
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.12	NA	0.12
			Chloroethane	NA	2E-6	NA	2E-6	Chloroethane	ND	NA	0.00062	NA	0.00062
			1,4-Dichlorobenzene	NA	8E-6	NA	8E-6	1,4-Dichlorobenzene	Increased liver weight	NA	0.0036	NA	0.0036
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.23	NA	0.23
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	1.2	NA	1.2
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	1.3	NA	1.3
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	1.2	NA	1.2
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	11	NA	11
			(Total)	NA	2E-4	NA	2E-4	(Total)		NA	16	NA	16
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	2E-4	NA	9E-7	2E-4	Arsenic	Skin/vascular	0.86	NA	0.0045	0.86
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.16	NA	0.012	0.18
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.15	NA	0.032	0.19
			Copper	--	NA	--	--	Copper	ND	0.066	NA	0.00034	0.066
			Manganese	--	NA	--	--	Manganese	CNS	1.1	NA	0.15	1.3
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.7	NA	0.13	1.9
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0029	NA	0.000015	0.0029
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.057	NA	0.00075	0.058
			Thallium	--	NA	--	--	Thallium	Liver enzymes	1.9	NA	0.010	2.0
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.14	NA	0.029	0.17
			Benzene	4E-5	NA	4E-6	4E-5	Benzene	Hematopoietic	0.41	NA	0.045	0.46
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.013	NA	0.0029	0.016
			Chloroethane	3E-7	NA	1E-8	--	Chloroethane	ND	0.00060	NA	0.000025	0.00062
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.031	NA	0.00021	0.031
			1,4-Dichlorobenzene	1E-6	NA	4E-7	1E-6	1,4-Dichlorobenzene	ND	0.0037	NA	0.0012	0.0048
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.16	NA	0.0035	0.16
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.097	NA	0.023	0.12
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.023	NA	0.0094	0.032
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0068	NA	0.0025	0.0093
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.061	NA	0.022	0.083
			(Total)	2E-4		5E-6	2E-4	(Total)		7.1		0.48	7.5
			Total Risk Across All Media and Exposure Routes:				**4E-4**		Total Risk Across All Media and Exposure Routes:				**23**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	3.7
Total immune HI=	1.9
Total kidney HI=	0.36
Total liver HI=	2.0
Total cardiovascular HI =	0.86
Total body/organ weight HI =	11
Total blood HI =	2.0
Total other HI =	1.7

Table 10.13.RME
Summary of Receptor Risks and Hazards for COPCs
Reasonable Maximum Exposure
Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	9E-5	NA	9E-5	Benzene	Hematopoietic	NA	4.4	NA	4.4
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.36	NA	0.36
			Chloroethane	NA	1E-6	NA	1E-6	Chloroethane	ND	NA	0.0019	NA	0.0019
			1,4-Dichlorobenzene	NA	5E-6	NA	5E-6	1,4-Dichlorobenzene	Increased liver weight	NA	0.011	NA	0.011
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.71	NA	0.71
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	3.5	NA	3.5
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	3.9	NA	3.9
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	3.6	NA	3.6
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	32	NA	32
			(Total)	NA	9E-5	NA	9E-5	(Total)		NA	49	NA	49
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	1E-4	NA	5E-7	1E-4	Arsenic	Skin/vascular	3.0	NA	0.013	3.0
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.58	NA	0.036	0.61
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.54	NA	0.095	0.63
			Copper	--	NA	--	--	Copper	ND	0.23	NA	0.0010	0.23
			Manganese	--	NA	--	--	Manganese	CNS	3.9	NA	0.43	4.4
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	6.1	NA	0.38	6.5
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.010	NA	0.000045	0.010
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.20	NA	0.0022	0.20
			Thallium	--	NA	--	--	Thallium	Liver enzymes	6.8	NA	0.030	6.8
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.50	NA	0.085	0.59
			Benzene	3E-5	NA	3E-6	3E-5	Benzene	Hematopoietic	1.4	NA	0.13	1.6
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.047	NA	0.0085	0.055
			Chloroethane	2E-7	NA	7E-9	--	Chloroethane	ND	0.0021	NA	0.000073	0.0022
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.11	NA	0.00062	0.11
			1,4-Dichlorobenzene	8E-7	NA	2E-7	1E-6	1,4-Dichlorobenzene	ND	0.013	NA	0.0035	0.016
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.54	NA	0.010	0.55
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.34	NA	0.067	0.41
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.079	NA	0.028	0.11
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.024	NA	0.0073	0.031
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.21	NA	0.065	0.28
			(Total)	1E-4		3E-6	1E-4	(Total)		25		1.4	26
			Total Risk Across All Media and Exposure Routes:				**2E-4**		Total Risk Across All Media and Exposure Routes:				**75**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	12
Total immune HI=	6.5
Total kidney HI=	1.2
Total liver HI=	7.0
Total cardiovascular HI =	3.0
Total body/organ weight HI =	33
Total blood HI =	6.5
Total other HI =	5.4

Table 10.1.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.0059		0.0059
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	3E-6	NA	3E-6	Benzene	Hematopoietic	NA	0.11	NA	0.11
			(Total)	NA	3E-6	NA	3E-6	(Total)			0.11		0.11
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	2E-7	NA	2E-7	Benzene	Hematopoietic	NA	0.0055	NA	0.0055
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00025	NA	0.00025
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000012	NA	0.000012
			1,4-Dichlorobenzene	NA	3E-9	NA	3E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000048	NA	0.0000048
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.00098	NA	0.00098
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0053	NA	0.0053
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0040	NA	0.0040
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0059	NA	0.0059
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	0.022	NA	0.022
Surface Soil	Surface Soil	Developed Area Surface Soil (unpaved)	Arsenic	9E-7	NA	4E-8	9E-7	Arsenic	Skin/vascular	0.016	NA	0.0006	0.016
			Chromium	--	NA	--	--	Chromium	ND	0.014	NA	--	0.014
			Copper	--	NA	--	--	Copper	ND	0.0050	NA	--	0.0050
			Manganese	--	NA	--	--	Manganese	CNS	0.0050	NA	--	0.0050
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.44	NA	--	0.44
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0067	NA	--	0.0067
			Benzo[a]pyrene	2E-7	NA	3E-8	2E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-8	NA	5E-9	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	3E-8	NA	5E-9	3E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	1E-6		7E-8	1E-6	(Total)		0.49		0.0006	0.49
			Total Risk Across All Media and Exposure Routes:				**5E-6**	Total Hazard Index Across All Media and Exposure Routes:					**0.63**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.020
Total immune HI=	0.44
Total kidney HI=	--
Total cardiovascular HI=	0.016
Total body/organ weight HI=	0.0059
Total blood HI=	0.13
Total other HI=	0.020

Table 10.2.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			(Total)	NA	0E+0	NA	0E+0	(Total)			0.0059		0.0059
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	3E-6	NA	3E-6	Benzene	Hematopoietic	NA	0.11	NA	0.11
			(Total)	NA	3E-6	NA	3E-6	(Total)			0.11		0.11
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	2E-7	NA	2E-7	Benzene	Hematopoietic	NA	0.0055	NA	0.0055
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00025	NA	0.00025
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000012	NA	0.000012
			1,4-Dichlorobenzene	NA	3E-9	NA	3E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000048	NA	0.0000048
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.00098	NA	0.00098
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0053	NA	0.0053
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0040	NA	0.0040
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0059	NA	0.0059
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	0.022	NA	0.022
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	5E-7	NA	2E-8	5E-7	Arsenic	Skin/vascular	0.0089	NA	0.00035	0.0092
			Chromium	--	NA	--	--	Chromium	ND	0.011	NA	--	0.011
			Copper	--	NA	--	--	Copper	ND	0.067	NA	--	0.067
			Manganese	--	NA	--	--	Manganese	CNS	0.0031	NA	--	0.0031
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.9	NA	--	1.9
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.015	NA	--	0.015
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0067	NA	--	0.0067
			Benzene	8.E-9	NA	--	8E-9	Benzene	Hematopoietic	0.00030	NA	--	0.00030
			Benz[a]anthracene	3.E-8	NA	5E-9	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2.E-7	NA	4E-8	3E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3.E-8	NA	5E-9	3E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6.E-8	NA	1E-8	7E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	9E-7		8E-8	1E-6	(Total)		2.0		0.00035	2.0

Table 10.2.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.000007	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.00007	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	--	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.0008	0.77
							Total Risk Across All Media and Exposure Routes: **1E-5**						Total Hazard Index Across All Media and Exposure Routes: **2.9**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.14
Total immune HI=	2.1
Total kidney HI=	0.035
Total liver HI=	0.23
Total cardiovascular HI=	0.10
Total body/organ weight HI=	0.030
Total blood HI=	0.19
Total other HI=	0.11

Table 10.3.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air	Mercury vapor	NA	0.00	NA	0.00	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			(Total)	NA	1E-8	NA	1E-8	(Total)			0.0059		0.0059
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)	Benzene	NA	3E-6	NA	3E-6	Benzene	Hematopoietic	NA	0.11	NA	0.11
			(Total)	NA	3E-6	NA	3E-6	(Total)			0.11		0.11
Groundwater	Air	Indoor Air (derived from groundwater)	Benzene	NA	2E-7	NA	2E-7	Benzene	Hematopoietic	NA	0.0055	NA	0.0055
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00025	NA	0.00025
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000012	NA	0.000012
			1,4-Dichlorobenzene	NA	3E-9	NA	3E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000048	NA	0.0000048
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.00098	NA	0.00098
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0053	NA	0.0053
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0040	NA	0.0040
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0059	NA	0.0059
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	0.022	NA	0.022
Surface Soil	Surface Soil	Developed Area Surface Soil (all)	Arsenic	5E-7	NA	2E-8	5E-7	Arsenic	Skin/vascular	0.0089	NA	0.00035	0.0092
			Chromium	--	NA	--	--	Chromium	ND	0.011	NA	--	0.011
			Copper	--	NA	--	--	Copper	ND	0.067	NA	--	0.067
			Manganese	--	NA	--	--	Manganese	CNS	0.0031	NA	--	0.0031
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	0.28	NA	--	0.28
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.015	NA	--	0.015
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0067	NA	--	0.0067
			Benzene	8.E-9	NA	--	8E-9	Benzene	Hematopoietic	0.00030	NA	--	0.00030
			Benz[a]anthracene	3.E-8	NA	5E-9	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2.E-7	NA	4E-8	3E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3.E-8	NA	5E-9	3E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	6.E-8	NA	1E-8	7E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			(Total)	9E-7		8E-8	1E-6	(Total)		0.39		0.00035	0.39

Table 10.3.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Developed Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.000007	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body/organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.00007	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	1E-8	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.0008	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**1.3**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.14
Total immune HI=	0.47
Total kidney HI=	0.035
Total liver HI=	0.23
Total cardiovascular HI=	0.10
Total body/organ weight HI=	0.030
Total blood HI=	0.19
Total other HI=	0.11

Table 10.4.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			Chromium IV particulates	NA	3E-7	NA	3E-7	Chromium IV particulates	Lung	NA	0.0017	NA	0.0017
			(Total)		3E-7		3E-7	(Total)			0.0076		0.0076
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	1E-11	NA	1E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000001	NA	0.00000001
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.046	NA	0.046
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.30	NA	0.30
			Benz[a]anthracene	NA	2E-8	NA	2E-8	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	2E-7	NA	2E-7	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	2E-8	NA	2E-8	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00017	NA	0.00017
			Benzo[k]fluoranthene	NA	1E-9	NA	1E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	1E-8	NA	1E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-8	NA	1E-8	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	1.9	NA	1.9
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	2.3	NA	2.3
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	3E-7	NA	3E-7	Benzene	Hematopoietic	NA	0.0093	NA	0.0093
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00043	NA	0.00043
			Chloroethane	NA	2E-8	NA	2E-8	Chloroethane	ND	NA	0.000020	NA	0.000020
			1,4-Dichlorobenzene	NA	5E-9	NA	5E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000080	NA	0.0000080
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0017	NA	0.0017
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0090	NA	0.0090
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0067	NA	0.0067
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0099	NA	0.0099
			(Total)	NA	3E-7	NA	3E-7	(Total)		NA	0.037	NA	0.037
Surface Soil	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.014	NA	--	0.014
			Arsenic	8E-7	NA	3E-8	9E-7	Arsenic	Skin/vascular	0.014	NA	0.00056	0.015
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.031	NA	--	0.031
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0028	NA	0.000073	0.0028
			Chromium	--	NA	--	--	Chromium	ND	0.40	NA	--	0.40
			Copper	--	NA	--	--	Copper	ND	0.0030	NA	--	0.0030
			Manganese	--	NA	--	--	Manganese	CNS	0.0047	NA	--	0.0047
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.26	NA	--	0.26
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0014	NA	--	0.0014
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0011	NA	--	0.0011
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0019	NA	--	0.0019
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.054	NA	--	0.054
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0033	NA	--	0.0033
			Zinc	--	NA	--	--	Zinc	Blood	0.034	NA	--	0.034
			Bis[2-ethylhexyl]phthalate	1E-7	NA	2E-8	2E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0041	NA	0.00054	0.0047
			Benz[a]anthracene	1E-7	NA	2E-8	1E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-7	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-8	2E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-7	NA	6E-8	4E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	7E-8	NA	1E-8	8E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	0E+0	Naphthalene	Body weight	0.0010	NA	0.00018	0.0012
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00068	NA	0.00012	0.00079
			PCBs	5E-7	NA	9E-8	6E-7	PCBs	Immunologic	0.094	NA	0.017	0.11
			(Total)	3E-6		4E-7	4E-6	(Total)		0.93		0.019	0.95

Table 10.4.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.000007	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.00007	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	--	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.0008	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**4.0**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.50
Total immune HI=	0.56
Total kidney HI=	0.069
Total liver HI=	0.27
Total cardiovascular HI=	0.11
Total body/organ weight HI=	2.0
Total blood HI=	0.11
Total other HI=	0.45

Table 10.5.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Air	Air	Outdoor Air											
			Mercury vapor	NA	--	NA	--	Mercury vapor	CNS	NA	0.0059	NA	0.0059
			Chromium IV particulates	NA	3E-7	NA	3E-7	Chromium IV particulates	Lung	NA	0.0017	NA	0.0017
			(Total)		3E-7		3E-7	(Total)			0.0076		0.0076
Subsurface Soil	Air	Indoor Air (derived from subsurface soil)											
			Carbazole	NA	1E-11	NA	1E-11	Carbazole	ND	NA	--	NA	--
			Dibenzofuran	NA	--	NA	--	Dibenzofuran	ND	NA	0.00000001	NA	0.00000001
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.046	NA	0.046
			Xylenes	NA	--	NA		Xylenes	CNS	NA	0.30	NA	0.30
			Benz[a]anthracene	NA	2E-8	NA	2E-8	Benz[a]anthracene	ND	NA	--	NA	--
			Benzo[a]pyrene	NA	2E-7	NA	2E-7	Benzo[a]pyrene	ND	NA	--	NA	--
			Benzo[b]fluoranthene	NA	2E-8	NA	2E-8	Benzo[b]fluoranthene	ND	NA	--	NA	--
			Benzo[ghi]perylene	NA	--	NA	--	Benzo[ghi]perylene	Nasal effects; hyperplasia	NA	0.00017	NA	0.00017
			Benzo[k]fluoranthene	NA	1E-9	NA	1E-9	Benzo[k]fluoranthene	ND	NA	--	NA	--
			Dibenz[a,h]anthracene	NA	1E-8	NA	1E-8	Dibenz[a,h]anthracene	ND	NA	--	NA	--
			Indeno[1,2,3-cd]pyrene	NA	1E-8	NA	1E-8	Indeno[1,2,3-cd]pyrene	ND	NA	--	NA	--
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	1.9	NA	1.9
			(Total)	NA	2E-7	NA	2E-7	(Total)		NA	2.3	NA	2.3
Groundwater	Air	Indoor Air (derived from groundwater)											
			Benzene	NA	3E-7	NA	3E-7	Benzene	Hematopoietic	NA	0.0093	NA	0.0093
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.00043	NA	0.00043
			Chloroethane	NA	2E-8	NA	2E-8	Chloroethane	ND	NA	0.000020	NA	0.000020
			1,4-Dichlorobenzene	NA	5E-9	NA	5E-9	1,4-Dichlorobenzene	Increased liver weight	NA	0.0000080	NA	0.0000080
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0017	NA	0.0017
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.0090	NA	0.0090
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.0067	NA	0.0067
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.0099	NA	0.0099
			(Total)	NA	3E-7	NA	3E-7	(Total)		NA	0.037	NA	0.037
Surface	Surface Soil	Undeveloped Area Surface Soil											
			Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.014	NA	--	0.014
			Arsenic	8E-7	NA	3E-8	9E-7	Arsenic	Skin/vascular	0.014	NA	0.00056	0.015
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.031	NA	--	0.031
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0028	NA	0.000073	0.0028
			Chromium	--	NA	--	--	Chromium	ND	0.40	NA	--	0.40
			Copper	--	NA	--	--	Copper	ND	0.0030	NA	--	0.0030
			Manganese	--	NA	--	--	Manganese	CNS	0.0047	NA	--	0.0047
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	5.8	NA	--	5.8
			Methylmercury	--	NA	--		Methylmercury	Neurologic	0.0014	NA	--	0.0014
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0011	NA	--	0.0011
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.0019	NA	--	0.0019
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.054	NA	--	0.054
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0033	NA	--	0.0033
			Zinc	--	NA	--	--	Zinc	Blood	0.034	NA	--	0.034
			Bis[2-ethylhexyl]phthalate	1E-7	NA	2E-8	2E-7	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0041	NA	0.00054	0.0047
			Benz[a]anthracene	1E-7	NA	2E-8	1E-7	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-6	NA	2E-7	1E-6	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	1E-7	NA	2E-8	2E-7	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-7	NA	6E-8	4E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	7E-8	NA	1E-8	8E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0010	NA	0.00018	0.0012
			2-Methylnaphthalene	--		--	--	2-Methylnaphthalene	Body weight	0.00068	NA	0.00012	0.00079
			PCBs	5E-7	NA	9E-8	6E-7	PCBs	Immunologic	0.094	NA	0.017	0.11
			(Total)	3E-6		4E-7	4E-6	(Total)		6.4		0.019	6.5

Table 10.5.Central Tendency (continued)
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future
Receptor Population: Long-term Worker - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	5E-6	NA	4E-10	5E-6	Arsenic	Skin/vascular	0.094	NA	0.000007	0.094
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.018	NA	0.000019	0.018
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.017	NA	0.000051	0.017
			Copper	--	NA	--	--	Copper	ND	0.0072	NA	0.00000054	0.0072
			Manganese	--	NA	--	--	Manganese	CNS	0.12	NA	0.00023	0.12
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.19	NA	0.00021	0.19
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00032	NA	0.000000024	0.00032
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0063	NA	0.0000012	0.0063
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.21	NA	0.000016	0.21
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.016	NA	0.000045	0.016
			Benzene	1E-6	NA	2E-9	1E-6	Benzene	Hematopoietic	0.045	NA	0.00007	0.045
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0015	NA	0.0000046	0.0015
			Chloroethane	1E-8	NA	6E-12	--	Chloroethane	ND	0.000065	NA	0.000000039	0.000065
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0034	NA	0.00000034	0.0034
			1,4-Dichlorobenzene	4E-8	NA	2E-10	4E-8	1,4-Dichlorobenzene	ND	0.00040	NA	0.0000019	0.00040
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.017	NA	0.0000055	0.017
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.011	NA	0.000036	0.011
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0025	NA	0.000015	0.0025
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.00075	NA	0.0000039	0.00075
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0067	NA	0.000035	0.0067
			(Total)	7E-6		3E-9	7E-6	(Total)		0.77		0.0008	0.77
			Total Risk Across All Media and Exposure Routes:				**1E-5**		Total Hazard Index Across All Media and Exposure Routes:				**9.5**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.50
Total immune HI=	6.1
Total kidney HI=	0.069
Total liver HI=	0.27
Total cardiovascular HI=	0.11
Total body/organ weight HI=	2.0
Total blood HI=	0.11
Total other HI=	0.45

Table 10.6.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/ Future
Receptor Population: Construction Worker - Developed Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Developed Area Subsurface Soil (1-20 ft depth)	Arsenic	2E-8	NA	4E-9	2E-8	Arsenic	Skin/vascular	0.0032	NA	0.00032	0.0035
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0011	NA	--	0.0011
			Chromium	--	NA	--	--	Chromium	ND	0.0043	NA	--	0.0043
			Copper	--	NA	--	--	Copper	ND	0.018	NA	--	0.018
			Manganese	--	NA	--	--	Manganese	CNS	0.0017	NA	--	0.0017
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.95	NA	--	0.95
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0066	NA	--	0.0066
			Benzene	2E-10	NA	--	2E-10	Benzene	Hematopoietic	0.000068	NA	--	0.000068
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.000058	NA	0.000025	0.000083
			PCBs	1E-9	NA	9E-10	2E-9	PCBs	Immunologic	0.0018	NA	0.00081	0.0026
			(Total)	2E-8		5E-9	3E-8	(Total)		0.99		0.0012	0.99
			Total Risk Across All Media and Exposure Routes:				**3E-8**	Total Hazard Index Across All Media and Exposure Routes:					**1.0**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0017
Total immune HI=	0.95
Total kidney HI=	0.0011
Total liver HI=	0.0066
Total cardiovascular HI=	0.0035
Total body/organ weight HI=	0.000083
Total blood HI=	0.000068
Total other HI=	0.022

Table 10.7.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Undeveloped Area Subsurface Soil (1-20 ft depth)	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0028	NA	--	0.0028
			Arsenic	4E-8	NA	8E-9	5E-8	Arsenic	Skin/vascular	0.0061	NA	0.00060	0.0067
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0026	NA	--	0.0026
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.00073	NA	0.000048	0.00078
			Chromium	--	NA	--	--	Chromium	ND	0.049	NA	--	0.049
			Copper	--	NA	--	--	Copper	ND	0.0037	NA	--	0.0037
			Manganese	--	NA	--	--	Manganese	CNS	0.0077	NA	--	0.0077
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.24	NA	--	0.24
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0000073	NA	--	0.0000073
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00039	NA	--	0.00039
			Selenium	--				Selenium	Selenosis: liver, CNS, skin	0.00015	NA	--	0.00015
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00048	NA	--	0.00048
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0051	NA	--	0.0051
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0029	NA	--	0.0029
			Zinc	--	NA	--	--	Zinc	Blood	0.0024	NA	--	0.0024
			Carbazole	1E-10	NA	7E-11	2E-10	Carbazole	ND	--	NA	--	--
			Dibenzofuran	--	NA	--	--	Dibenzofuran	ND	0.00022	NA	0.000073	0.00030
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.0000093	NA	--	0.0000093
			Xylene	--	NA			Xylene	Hyperactivity, body weight, mortality	0.000015	NA	--	0.000015
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.000058	NA	0.000025	0.000083
			Benz[a]anthracene	2E-8	NA	2E-8	3E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	1E-7	NA	1E-7	3E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-8	NA	2E-8	3E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Benzo[ghi]perylene	--	NA	--	--	Benzo[ghi]perylene	Body weight	0.000014	NA	0.0000062	0.000021
			Benzo[k]fluoranthene	3E-10	NA	2E-10	5E-10	Benzo[k]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	3E-9	NA	2E-9	5E-9	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-9	NA	2E-9	5E-9	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.000029	NA	0.000013	0.000042
			PCBs	1E-8	NA	1E-8	2E-8	PCBs	Immunologic	0.022	NA	0.0099	0.031
			(Total)	2E-7		2E-7	4E-7	(Total)		0.34		0.011	0.35
			Total Risk Across All Media and Exposure Routes:				**4E-7**		Total Hazard Index Across All Media and Exposure Routes:				**0.35**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0077
Total immune HI=	0.27
Total kidney HI =	0.0034
Total liver HI=	0.0051
Total cardiovascular HI =	0.0067
Total body/organ weight HI=	0.00054
Total blood HI =	0.0054
Total other HI=	0.056

Table 10.8.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0040	NA	--	0.0040
			Arsenic	2E-7	NA	8E-9	3E-7	Arsenic	Skin/vascular	0.0042	NA	0.00014	0.0044
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0093	NA	--	0.0093
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.00082	NA	0.000019	0.00084
			Chromium	--	NA	--	--	Chromium	ND	0.12	NA	--	0.12
			Copper	--	NA	--	--	Copper	ND	0.00088	NA	--	0.00088
			Manganese	--	NA	--	--	Manganese	CNS	0.0014	NA	--	0.0014
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.077	NA	--	0.077
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00041	NA	--	0.00041
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00032	NA	--	0.00032
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00056	NA	--	0.00056
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.016	NA	--	0.016
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00097	NA	--	0.00097
			Zinc	--	NA	--	--	Zinc	Blood	0.010	NA	--	0.010
			Bis[2-ethylhexyl]phthalate	4E-8	NA	5E-9	5E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0012	NA	0.00014	0.0014
			Benz[a]anthracene	3E-8	NA	4E-9	3E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	5E-8	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-8	NA	6E-9	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-7	NA	2E-8	1E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	3E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--		--		Napthalene	Body weight	0.00031		0.000046	0.00036
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00020	NA	0.000030	0.00023
			PCBs	1E-7	NA	2E-8	2E-7	PCBs	Immunologic	0.028	NA	0.0045	0.032
			(Total)	1E-6		1E-7	1E-6	(Total)		0.28		0.0048	0.28
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	2E-7	NA	7E-9	2E-7	Arsenic	Skin/vascular	0.0037	NA	0.00013	0.0039
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000026	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.0066	NA	--	0.0066
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.55	NA	--	0.55
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00016	NA	--	0.00016
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0076	NA	--	0.0076
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00098	NA	--	0.00098
			Zinc	--	NA	--	--	Zinc	Blood	0.0015	NA	--	0.0015
			Benz[a]anthracene	2E-8	NA	3E-9	2E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-7	NA	3E-8	2E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-8	NA	3E-9	2E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-8	NA	6E-9	4E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-8	NA	2E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	2E-8	NA	4E-9	3E-8	PCBs	Immunologic	0.0046	NA	0.00074	0.0054
			(Total)	5E-7		5E-8	6E-7	(Total)		0.57		0.00090	0.57
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00014	NA	0.0016	0.0017
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.00090	NA	0.0061	0.0070
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000042	NA	0.00000020	0.00000062
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0010		0.0077	0.0087
			Total Risk Across All Media and Exposure Routes:				**2E-6**	Total Hazard Index Across All Media and Exposure Routes:					**0.86**

Notes:

NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0037
Total immune HI=	0.67
Total kidney HI=	0.011
Total liver HI=	0.024
Total cardiovascular HI=	0.0082
Total body/organ weight HI=	0.0023
Total blood HI=	0.014
Total other HI=	0.13

Table 10.9.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0058	NA	--	0.0058
			Arsenic	3E-7	NA	3E-8	4E-7	Arsenic	Skin/vascular	0.0060	NA	0.00058	0.0066
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.013	NA	--	0.013
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000075	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.17	NA	--	0.17
			Copper	--	NA	--	--	Copper	ND	0.0013	NA	--	0.0013
			Manganese	--	NA	--	--	Manganese	CNS	0.0020	NA	--	0.0020
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.11	NA	--	0.11
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00059	NA	--	0.00059
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00045	NA	--	0.00045
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00080	NA	--	0.00080
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.023	NA	--	0.023
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.015	NA	--	0.015
			Bis[2-ethylhexyl]phthalate	6E-8	NA	2E-8	8E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0017	NA	0.00056	0.0023
			Benz[a]anthracene	4E-8	NA	2E-8	6E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-7	NA	2E-7	7E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-8	NA	2E-8	8E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	6E-8	2E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-8	NA	1E-8	4E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.00045	NA	0.00019	0.00063
			2-Methlynapthalene	--		--		2-Methlynapthalene	Body weight	0.00029		0.00012	0.00041
			PCBs	2E-7	NA	9E-8	3E-7	PCBs	Immunologic	0.040	NA	0.018	0.058
			(Total)	1E-6		5E-7	2E-6	(Total)		0.39		0.019	0.41
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-7	NA	3E-8	3E-7	Arsenic	Skin/vascular	0.0053	NA	0.00051	0.0058
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0017	NA	0.00011	0.0018
			Chromium	--	NA	--	--	Chromium	ND	0.0094	NA	--	0.0094
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.78	NA	--	0.78
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00023	NA	--	0.00023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.011	NA	--	0.011
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.0021	NA	--	0.0021
			Benz[a]anthracene	3E-8	NA	1E-8	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	1E-7	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-8	NA	1E-8	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-8	NA	2E-8	8E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	9E-9	3E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-8	NA	2E-8	5E-8	PCBs	Immunologic	0.0066	NA	0.0030	0.0096
			(Total)	8E-7		2E-7	1E-6	(Total)		0.82		0.0036	0.82
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00019	NA	0.0016	0.0018
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0013	NA	0.0061	0.0074
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000060	NA	0.00000020	0.00000081
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0015		0.0077	0.0092
			Total Risk Across All Media and Exposure Routes:				**3E-6**	Total Hazard Index Across All Media and Exposure Routes:					**1.2**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0046
Total immune HI=	0.97
Total kidney HI=	0.016
Total liver HI=	0.034
Total cardiovascular HI=	0.012
Total body/organ weight HI=	0.0038
Total blood HI=	0.019
Total other HI=	0.19

Table 10.10.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0040	NA	--	0.0040
			Arsenic	2E-7	NA	8E-9	3E-7	Arsenic	Skin/vascular	0.0042	NA	0.00014	0.0044
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.0093	NA	--	0.0093
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.00082	NA	0.000019	0.00084
			Chromium	--	NA	--	--	Chromium	ND	0.12	NA	--	0.12
			Copper	--	NA	--	--	Copper	ND	0.00088	NA	--	0.00088
			Manganese	--	NA	--	--	Manganese	CNS	0.0014	NA	--	0.0014
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	1.7	NA	--	1.7
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00041	NA	--	0.00041
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00032	NA	--	0.00032
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00056	NA	--	0.00056
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.016	NA	--	0.016
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00097	NA	--	0.00097
			Zinc	--	NA	--	--	Zinc	Blood	0.010	NA	--	0.010
			Bis[2-ethylhexyl]phthalate	4E-8	NA	5E-9	5E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0012	NA	0.00014	0.0014
			Benz[a]anthracene	3E-8	NA	4E-9	3E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	5E-8	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	4E-8	NA	6E-9	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	1E-7	NA	2E-8	1E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	3E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--				Napthalene	Body weight	0.00031		0.000046	0.00036
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00020	NA	0.000030	0.00023
			PCBs	1E-7	NA	2E-8	2E-7	PCBs	Immunologic	0.028	NA	0.0045	0.032
			(Total)	1E-6		1E-7	1E-6	(Total)		1.9		0.0048	1.9
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	2E-7	NA	7E-9	2E-7	Arsenic	Skin/vascular	0.0037	NA	0.00013	0.0039
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000026	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.0066	NA	--	0.0066
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.55	NA	--	0.55
			Methylmercury	--		--	--	Methylmercury	Neurologic	0.00016	NA	--	0.00016
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.0076	NA	--	0.0076
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.00098	NA	--	0.00098
			Zinc	--	NA	--	--	Zinc	Blood	0.0015	NA	--	0.0015
			Benz[a]anthracene	2E-8	NA	3E-9	2E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	2E-7	NA	3E-8	2E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	2E-8	NA	3E-9	2E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	4E-8	NA	6E-9	4E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	1E-8	NA	2E-9	2E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	2E-8	NA	4E-9	3E-8	PCBs	Immunologic	0.0046	NA	0.00074	0.0054
			(Total)	5E-7		5E-8	6E-7	(Total)		0.57		0.00090	0.57
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00014	NA	0.0016	0.0017
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.00090	NA	0.0061	0.0070
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000042	NA	0.00000020	0.00000062
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0010		0.0077	0.0087
			Total Risk Across All Media and Exposure Routes:				**2E-6**	Total Hazard Index Across All Media and Exposure Routes:					**2.5**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0037
Total immune HI=	2.3
Total kidney HI=	0.011
Total liver HI=	0.024
Total cardiovascular HI=	0.0082
Total body/organ weight HI=	0.0023
Total blood HI=	0.014
Total other HI=	0.13

Table 10.11.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor - Undeveloped Area
Includes Mercury Hot Spot (fractional intake 0.05)
Receptor Age: Adolescent/Pre-Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Surface Soil	Surface Soil	Undeveloped Area Surface Soil	Antimony	--	NA	--	--	Antimony	Longevity; metabolic	0.0058	NA	--	0.0058
			Arsenic	3E-7	NA	3E-8	4E-7	Arsenic	Skin/vascular	0.0060	NA	0.00058	0.0066
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.013	NA	--	0.013
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0012	NA	0.000075	0.0012
			Chromium	--	NA	--	--	Chromium	ND	0.17	NA	--	0.17
			Copper	--	NA	--	--	Copper	ND	0.0013	NA	--	0.0013
			Manganese	--	NA	--	--	Manganese	CNS	0.0020	NA	--	0.0020
			Mercury (total) Hot Spot	--	NA	--	--	Mercury (total) Hot Spot	Immunologic	2.4	NA	--	2.4
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00059	NA	--	0.00059
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.00045	NA	--	0.00045
			Silver	--	NA	--	--	Silver	Skin (argyria)	0.00080	NA	--	0.00080
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.023	NA	--	0.023
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.015	NA	--	0.015
			Bis[2-ethylhexyl]phthalate	6E-8	NA	2E-8	8E-8	Bis[2-ethylhexyl]phthalate	Increased liver weight	0.0017	NA	0.00056	0.0023
			Benz[a]anthracene	4E-8	NA	2E-8	6E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	5E-7	NA	2E-7	7E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	5E-8	NA	2E-8	8E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	2E-7	NA	6E-8	2E-7	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	3E-8	NA	1E-8	4E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			Napthalene	--	NA	--	--	Napthalene	Body weight	0.00045	NA	0.00019	0.00063
			2-Methlynapthalene	--	NA	--	--	2-Methlynapthalene	Body weight	0.00029	NA	0.00012	0.00041
			PCBs	2E-7	NA	9E-8	3E-7	PCBs	Immunologic	0.040	NA	0.018	0.058
			(Total)	1E-6		5E-7	2E-6	(Total)		2.7		0.019	2.8
Sediment	Sediment	Undeveloped Area Surface Sediment	Arsenic	3E-7	NA	3E-8	3E-7	Arsenic	Skin/vascular	0.0053	NA	0.00051	0.0058
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.0017	NA	0.00011	0.0018
			Chromium	--	NA	--	--	Chromium	ND	0.0094	NA	--	0.0094
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.78	NA	--	0.78
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00023	NA	--	0.00023
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.011	NA	--	0.011
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.0014	NA	--	0.0014
			Zinc	--	NA	--	--	Zinc	Blood	0.0021	NA	--	0.0021
			Benz[a]anthracene	3E-8	NA	1E-8	4E-8	Benz[a]anthracene	ND	--	NA	--	--
			Benzo[a]pyrene	3E-7	NA	1E-7	4E-7	Benzo[a]pyrene	ND	--	NA	--	--
			Benzo[b]fluoranthene	3E-8	NA	1E-8	4E-8	Benzo[b]fluoranthene	ND	--	NA	--	--
			Dibenz[a,h]anthracene	5E-8	NA	2E-8	8E-8	Dibenz[a,h]anthracene	ND	--	NA	--	--
			Indeno[1,2,3-cd]pyrene	2E-8	NA	9E-9	3E-8	Indeno[1,2,3-cd]pyrene	ND	--	NA	--	--
			PCBs	3E-8	NA	2E-8	5E-8	PCBs	Immunologic	0.0066	NA	0.0030	0.0096
			(Total)	8E-7		2E-7	1E-6	(Total)		0.82		0.0036	0.82
Surface Water	Surface Water	Undeveloped Area Surface Water	Manganese	--	NA	--	--	Manganese	CNS	0.00019	NA	0.0016	0.0018
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.0013	NA	0.0061	0.0074
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00000060	NA	0.00000020	0.00000081
			(Total)	0E+0		0E+0	0E+0	(Total)		0.0015		0.0077	0.0092
			Total Risk Across All Media and Exposure Routes:				**3E-6**	Total Hazard Index Across All Media and Exposure Routes:					**3.6**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
PCBs - Polychlorinated biphenyls
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.0046
Total immune HI=	3.3
Total kidney HI=	0.016
Total liver HI=	0.034
Total cardiovascular HI=	0.012
Total body/organ weight HI=	0.0038
Total blood HI=	0.019
Total other HI=	0.19

Table 10.12.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	8E-7	NA	8E-7	Benzene	Hematopoietic	NA	0.026	NA	0.026
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0021	NA	0.0021
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000011	NA	0.000011
			1,4-Dichlorobenzene	NA	4E-8	NA	4E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.000065	NA	0.000065
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0042	NA	0.0042
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	0.021	NA	0.021
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.023	NA	0.023
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.021	NA	0.021
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.19	NA	0.19
			(Total)	NA	8E-7	NA	8E-7	(Total)		NA	0.29	NA	0.29
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	3E-5	NA	1E-7	3E-5	Arsenic	Skin/vascular	0.60	NA	0.0019	0.60
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.12	NA	0.0053	0.12
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.11	NA	0.014	0.12
			Copper	--	NA	--	--	Copper	ND	0.046	NA	0.00015	0.046
			Manganese	--	NA	--	--	Manganese	CNS	0.79	NA	0.063	0.85
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	1.2	NA	0.056	1.3
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.0020	NA	0.0000065	0.0020
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.040	NA	0.00032	0.041
			Thallium	--	NA	--	--	Thallium	Liver enzymes	1.4	NA	0.0044	1.4
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.10	NA	0.012	0.11
			Benzene	8E-6	NA	5E-7	9E-6	Benzene	Hematopoietic	0.29	NA	0.019	0.31
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0094	NA	0.0012	0.011
			Chloroethane	6E-8	NA	2E-9	--	Chloroethane	ND	0.00042	NA	0.000011	0.00043
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.022	NA	0.000091	0.022
			1,4-Dichlorobenzene	2E-7	NA	5E-8	3E-7	1,4-Dichlorobenzene	ND	0.0026	NA	0.00051	0.0031
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.11	NA	0.0015	0.11
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.068	NA	0.0099	0.078
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.016	NA	0.0041	0.020
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0048	NA	0.0011	0.0059
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.043	NA	0.0094	0.052
			(Total)	4E-5		7E-7	4E-5	(Total)		4.9		0.20	5.1
			Total Risk Across All Media and Exposure Routes:				**4E-05**		Total Risk Across All Media and Exposure Routes:				**5.4**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.92
Total immune HI=	1.3
Total kidney HI=	0.24
Total liver HI=	1.4
Total cardiovascular HI =	0.60
Total body/organ weight HI =	0.37
Total blood HI =	0.45
Total other HI =	0.19

Table 10.13.Central Tendency
Summary of Receptor Risks and Hazards for COPCs

Ventron/Velsicol Site OU1

Scenario Timeframe: Future Hypothetical
Receptor Population: Resident - domestic use of groundwater
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal [a]	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal [a]	Exposure Routes Total
Groundwater	Air	Indoor Air (showering/ bathing)	Benzene	NA	1E-6	NA	1E-6	Benzene	Hematopoietic	NA	0.047	NA	0.047
			Chlorobenzene	NA	--	NA	--	Chlorobenzene	ND	NA	0.0039	NA	0.0039
			Chloroethane	NA	1E-8	NA	1E-8	Chloroethane	ND	NA	0.000021	NA	0.000021
			1,4-Dichlorobenzene	NA	5E-8	NA	5E-8	1,4-Dichlorobenzene	Increased liver weight	NA	0.00012	NA	0.00012
			1,2-Dichloroethene, isomers	NA	--	NA	--	1,2-Dichloroethene, isomers	Serum enzymes	NA	0.0077	NA	0.0077
			4-Methylphenol	NA	--	NA	--	4-Methylphenol	ND	NA	0.038	NA	0.038
			Toluene	NA	--	NA	--	Toluene	Neurological effects	NA	0.042	NA	0.042
			Xylenes	NA	--	NA	--	Xylenes	CNS	NA	0.039	NA	0.039
			Naphthalene	NA	--	NA	--	Naphthalene	Nasal effects; hyperplasia	NA	0.35	NA	0.35
			(Total)	NA	1E-6	NA	1E-6	(Total)		NA	0.53	NA	0.53
Groundwater	Groundwater	Groundwater Sitewide	Arsenic	6E-5	NA	2E-7	6E-5	Arsenic	Skin/vascular	0.13	NA	0.0044	0.13
			Barium	--	NA	--	--	Barium	None reported (kidney)	0.024	NA	0.012	0.036
			Cadmium	--	NA	--	--	Cadmium	Kidney	0.023	NA	0.031	0.054
			Copper	--	NA	--	--	Copper	ND	0.0098	NA	0.00033	0.010
			Manganese	--	NA	--	--	Manganese	CNS	0.17	NA	0.14	0.31
			Mercury (total)	--	NA	--	--	Mercury (total)	Immunologic	0.26	NA	0.13	0.38
			Methylmercury	--	NA	--	--	Methylmercury	Neurologic	0.00043	NA	0.000015	0.00044
			Nickel	--	NA	--	--	Nickel	Decreased body and organ weights	0.0085	NA	0.00073	0.0092
			Thallium	--	NA	--	--	Thallium	Liver enzymes	0.29	NA	0.0099	0.30
			Vanadium	--	NA	--	--	Vanadium	Hematopoietic	0.021	NA	0.028	0.049
			Benzene	1E-5	NA	8E-7	1E-5	Benzene	Hematopoietic	0.061	NA	0.044	0.10
			Chlorobenzene	--	NA	--	--	Chlorobenzene	Liver	0.0020	NA	0.0028	0.0048
			Chloroethane	1E-7	NA	2E-9	--	Chloroethane	ND	0.000088	NA	0.000024	0.00011
			1,2-Dichloroethene, isomers	--	NA	--	--	1,2-Dichloroethene, isomers	Serum enzymes	0.0046	NA	0.00021	0.0048
			1,4-Dichlorobenzene	4E-7	NA	7E-8	5E-7	1,4-Dichlorobenzene	ND	0.00054	NA	0.0012	0.0017
			4-Methylphenol	--	NA	--	--	4-Methylphenol	ND	0.023	NA	0.0034	0.026
			Toluene	--	NA	--	--	Toluene	Liver and kidney weight	0.014	NA	0.022	0.037
			Xylene	--	NA	--	--	Xylene	Hyperactivity, body wt, mortality	0.0033	NA	0.0092	0.012
			2-Methylnaphthalene	--	NA	--	--	2-Methylnaphthalene	Body weight	0.0010	NA	0.0024	0.0034
			Naphthalene	--	NA	--	--	Naphthalene	Body weight	0.0090	NA	0.021	0.030
			(Total)	7E-5		1E-6	7E-5	(Total)		1.0		0.46	1.5
			Total Risk Across All Media and Exposure Routes:				**7E-05**		Total Risk Across All Media and Exposure Routes:				**2.0**

Notes:
NA - not applicable
ND - no data available in EPA sources regarding toxicity endpoint
CNS - central nervous system
[a] Consistent with EPA guidance, dermal pathway was analyzed where absorption data were available (U.S. EPA 2004). See text.

Total CNS HI=	0.40
Total immune HI=	0.38
Total kidney HI=	0.090
Total liver HI=	0.31
Total cardiovascular HI =	0.13
Total body/organ weight HI =	0.43
Total blood HI =	0.20
Total other HI =	0.088

Appendix B

Region IX Tables of Screening Values

USERS' GUIDE AND BACKGROUND TECHNICAL DOCUMENT FOR USEPA REGION 9'S PRELIMINARY REMEDIATION GOALS (PRG) TABLE

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DISCLAIMER

Preliminary remediation goals (PRGs) focus on common exposure pathways and may not consider all exposure pathways encountered at CERCLA / RCRA sites (Exhibit 1-1). PRGs do not consider impact to groundwater or address ecological concerns. The PRG Table is specifically not intended as a (1) stand-alone decision-making tool, (2) as a substitute for EPA guidance for preparing baseline risk assessments, (3) a rule to determine if a waste is hazardous under RCRA, or (4) set of final cleanup or action levels to be applied at contaminated sites.

The guidance set out in this document is not final Agency action. It is not intended, nor can it be relied upon to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided herein, or act at variance with the guidance, based on an analysis of specific circumstances. The Agency also reserves the right to change this guidance at any time without public notice.

1.0 INTRODUCTION

Region 9 Preliminary Remediation Goals (PRGs) are risk-based tools for evaluating and cleaning up contaminated sites. They are being used to streamline and standardize all stages of the risk decision-making process.

The Region 9 PRG Table combines current human health toxicity values with standard exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that are considered by the Agency to be health protective of human exposures (including sensitive groups), over a lifetime. Chemical concentrations above these levels would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. Further evaluation may include additional sampling, consideration of ambient levels in the environment, or a reassessment of the assumptions contained in these screening-level estimates (e.g. appropriateness of route-to-route extrapolations, appropriateness of using chronic toxicity values to evaluate childhood exposures, appropriateness of generic exposure factors for a specific site etc.).

The risk-based concentrations presented in the Table may be used as screening goals or initial cleanup goals if applicable. Generally a screening goal is intended to provide health protection without knowledge of the specific exposure conditions at a site. PRGs may also be used as initial cleanup goals when the exposure assumptions based on site-specific data match up with the default exposure assumptions in the PRG Table. When considering PRGs as cleanup goals, it is EPA's preference to assume maximum beneficial use of a property (that is, residential use) unless a non-residential number (for example, industrial soil PRG) can be justified.

Before applying PRGs at a particular site, the Table user should consider whether the exposure pathways and exposure scenarios at the site are fully accounted for in the PRG calculations. Region 9 PRG concentrations are based on direct contact pathways for which generally accepted methods, models, and assumptions have been developed (i.e. ingestion, dermal contact, and inhalation) for specific land-use conditions and do not consider impact to groundwater or ecological receptors (see Developing a Conceptual Site Model below).

EXHIBIT 1-1
TYPICAL EXPOSURE PATHWAYS BY MEDIUM
FOR RESIDENTIAL AND INDUSTRIAL LAND USES[a]

EXPOSURE PATHWAYS, ASSUMING:		
MEDIUM	RESIDENTIAL LAND USE	INDUSTRIAL LAND USE
Ground Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
Surface Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
	Ingestion during swimming	
	Ingestion of contaminated fish	
Soil	***Ingestion***	***Ingestion***
	Inhalation of particulates	***Inhalation of particulates***
	Inhalation of volatiles	***Inhalation of volatiles***
	Exposure to indoor air from soil gas	Exposure to indoor air from soil gas
	Exposure to ground water contaminated by soil leachate	Exposure to ground water contaminated by soil leachate
	Ingestion via plant, meat, or dairy products	Inhalation of particulates from trucks and heavy equipment
	Dermal absorption	***Dermal absorption***

Footnote:
[a]Exposure pathways considered in the PRG calculations are indicated in boldface italics.

2.0 READING THE PRG TABLE

2.1 General Considerations

With the exceptions described below, PRGs are chemical concentrations that correspond to fixed levels of risk (i.e. either a one-in-one million [10^{-6}] cancer risk or a noncarcinogenic hazard quotient of 1) in soil, air, and water. In most cases, where a substance causes both cancer and noncancer (systemic) effects, the 10^{-6} cancer risk will result in a more stringent criteria and consequently this value is presented in the printed copy of the Table. PRG concentrations that equate to a 10^{-6} cancer risk are indicated by "ca". PRG concentrations that equate to a hazard quotient of 1 for noncarcinogenic concerns are indicated by "nc".

If the risk-based concentrations are to be used for site screening, it is recommended that both cancer and noncancer-based PRGs be used. Both carcinogenic and noncarcinogenic values may be obtained at the Region 9 PRG homepage at:

http://www.epa.gov/region09/waste/sfund/prg/

It has come to my attention that some users have been multiplying the cancer PRG concentrations by 10 or 100 to set "action levels" for triggering remediation or to set less stringent cleanup levels for a specific site after considering non-risk-based factors such as ambient levels, detection limits, or technological feasibility. This risk management practice recognizes that there may be a range of values that may be "acceptable" for carcinogenic risk (EPA's risk management range is one-in-a-million [10^{-6}] to one-in-ten thousand [10^{-4}]). However, this practice could lead one to overlook serious noncancer health threats and it is strongly recommended that the user consult with a toxicologist or regional risk assessor before doing this. For carcinogens, I have indicated by asterisk ("ca*") in the PRG Table where the noncancer PRGs would be exceeded if the cancer value that is displayed is multiplied by 100. Two stars ("ca**") indicate that the noncancer values would be exceeded if the cancer PRG were multiplied by 10. There is no range of "acceptable" noncarcinogenic "risk" so that under no circumstances should noncancer PRGs be multiplied by 10 or 100, when setting final cleanup criteria. In the rare case where noncancer PRGs are more stringent than cancer PRGs set at one-in-one-million risk, a similar approach has been applied (e.g. “nc**”).

In general, PRG concentrations in the printed Table are risk-based but for soil there are two important exceptions: (1) for several volatile chemicals, PRGs are based on the soil saturation equation ("sat") and (2) for relatively less toxic inorganic and semivolatile contaminants, a non-risk based "ceiling limit" concentration is given as 10^{+5} mg/kg ("max"). At the Region 9 PRG website, the risk-based calculations for these same chemicals are also available in the “InterCalc Tables” if the user wants to view the risk-based concentrations prior to the application of “sat” or “max”. For more information on why the “sat” value and not a risk-based value is presented for several volatile chemicals in the PRG Table, please see the discussion in Section 4.6.

With respect to applying a “ceiling limit” for chemicals other than volatiles, it is recognized that

this is not a universally accepted approach. Some within the agency argue that all values should be risk-based to allow for scaling (for example, if the risk-based PRG is set at a hazard quotient = 1.0, and the user would like to set the hazard quotient to 0.1 to take into account multiple chemicals, then this is as simple as multiplying the risk-based PRG by 1/10th). If scaling is necessary, PRG users can do this simply by referring to the "InterCalc Tables" at our website where risk-based soil concentrations are presented for all chemicals (see soil calculations, "combined" pathways column).

In spite of the fact that applying a ceiling limit is not a universally accepted approach, we have opted to continue applying a "max"soil concentration to the PRG Table for the following reasons:

- Risk-based PRGs for some chemicals in soil exceed unity (>1,000,000 mg/kg) which is not possible.

- The ceiling limit of 10^{+5} mg/kg is equivalent to a chemical representing 10% by weight of the soil sample. At this contaminant concentration (and higher), the assumptions for soil contact may be violated (for example, soil adherence and windborne dispersion assumptions) due to the presence of the foreign substance itself.
- PRGs currently do not address short-term exposures (e.g. pica children and construction workers). Although extremely high soil PRGs are likely to represent relatively non-toxic chemicals, such high values may not be justified if in fact more toxicological data were available for evaluating short-term and/or acute exposures.

In addition to Region 9 PRG values, the PRG Table also includes California EPA PRGs ("CAL-Modified PRGs") for specific chemicals where CAL-EPA screening values may deviate significantly from the federal values (see Section 2.4) and EPA OSWER soil screening levels (SSLs) for protection of groundwater (see Section 2.5).

2.2 Toxicity Values

Hierarchy of Toxicity Values

There is a new hierarchy of human health toxicity values that replaces earlier guidance. This is important because human toxicity values known as cancer slope factors (SF) or non-cancer reference doses (RfDs) form the basis of the PRG values listed in the table. As noted in OSWER Directive 9285.7-53 (dated December 5, 2003), the updated EPA hierarchy is as follows: Tier 1 - EPA's Integrated IRIS, Tier 2 - EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs), and Tier 3 - Other Toxicity Values. Tier 3 includes additional EPA sources (e.g. historic HEAST and NCEA provisional values) and non-EPA sources of toxicity information (e.g. California EPA toxicity values).

The PRG Table lists Tier 1 toxicity values from IRIS as “i” and Tier 2 toxicity values known as PPRTVs as “p”. Tier 3 toxicity values were obtained from various sources including California EPA databases “c”, historic HEAST tables “h” and NCEA provisional values “n”.

Inhalation Conversion Factors

As of January 1991, IRIS and NCEA databases no longer present RfDs or SFs for the inhalation route. These criteria have been replaced with reference concentrations (RfC) for noncarcinogenic effects and unit risk factors (URF) for carcinogenic effects. However, for purposes of estimating risk and calculating risk-based concentrations, inhalation reference doses (RfDi) and inhalation slope factors (SFi) are preferred. This is not a problem for most chemicals because the inhalation toxicity criteria are easily converted. To calculate an RfDi from an RfC, the following equation and assumptions may be used for most chemicals:

$$\text{RfDi}\ \frac{\text{mg}}{(\text{kg-day})} = \text{RfC}\,(\text{mg}/\text{m}^3) \times \frac{20\text{m}^3}{\text{day}} \times \frac{1}{70\text{kg}}$$

Likewise, to calculate an SFi from an inhalation URF, the following equation and assumptions may be used:

$$\text{SFi}\ \frac{(\text{kg-day})}{(\text{mg})} = \text{URF}\,(\text{m}^3/\text{ug}) \times \frac{\text{day}}{20\text{m}^3} \times 70\text{kg} \times \frac{10^3\ \text{ug}}{\text{mg}}$$

Route-to-Route Methods

Route-to-route extrapolations ("r") were frequently used when there were no toxicity values available for a given route of exposure. Oral cancer slope factors ("SFo") and reference doses ("RfDo") were used for both oral and inhaled exposures for organic compounds lacking inhalation values. Inhalation slope factors ("SFi") and inhalation reference doses ("RfDi") were used for both inhaled and oral exposures for organic compounds lacking oral values. Route extrapolations were not performed for inorganics due to portal of entry effects and known differences in absorption efficiency for the two routes of exposure.

An additional route extrapolation is the use of oral toxicity values for evaluating dermal exposures. In general, dermal toxicity values are not listed in EPA databases and consequently must be estimated from oral toxicity information. However, a scientifically defensible data base often does not exist for making an adjustment to the oral slope factor/RfD so that the oral toxicity value is often applied without adjustment to estimate a dermal toxicity value. For more information please refer to recent Agency guidance (USEPA 2004) entitled *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* available on the web at: http://www.epa.gov/superfund/programs/risk/ragse/index.htm

Please note that whenever route-extrapolated values are used to calculate risk-based PRGs, additional uncertainties are introduced in the calculation.

2.3 PRGs Derived with Special Considerations

Most of the Region 9 PRGs are readily derived by referring to Equations 4-1 thru 4-8 contained in this "User's Guide/Technical Background Document" to the Region 9 PRGs. However, there are some chemicals for which the standard equations do no apply and/or adjustments to the toxicity values are recommended. These special case chemicals are discussed below.

Cadmium The PRGs for Cadmium are based on the oral RfD for water which is slightly more conservative (by a factor of 2) than the RfD for food. Because the PRGs are considered screening values, we elected to use the more conservative RfD for cadmium. However, reasonable arguments could be made for applying an RfD for food (instead of the oral RfD for water) for some media such as soils.

The water RfD for cadmium assumes a 5% oral absorption factor. The assumption of an oral absorption efficiency of 5% for Cadmium leads to an estimated dermal RfD of 2.5E-05. The PRG calculations incorporate these adjustments per recent guidance (USEPA 2004).

Chromium 6 For Chromium 6 (Cr6), IRIS shows an air unit risk of 1.2E-2 per (ug/cu.m) or expressed as an inhalation cancer slope factor (adjusting for inhalation/body weight) of 42 $(mg/kg\text{-}day)^{-1}$. However, the supporting documentation in the IRIS file states that these toxicity values are based on an assumed 1:6 ratio of Cr6:Cr3. Because of this assumption, we in Region 9 prefer to present PRGs based on these cancer toxicity values as "total chromium" numbers.

In the PRG Table, we also include a Cr6 specific value (assuming 100% Cr6) that is derived by multiplying the "total chromium" value by 7, yielding a cancer potency factor of 290 $(mg/kg\text{-}day)^{-1}$. This is considered to be an overly conservative assumption by some within the Agency. However, this calculation is also consistent with the State of California's interpretation of the Mancuso study that forms the basis of Cr6's toxicity values.

If you are working on a project outside of California (and outside of Region 9), you may want to contact the appropriate regulatory officials to determine what their position is on this issue. As mentioned, Region 9 also includes PRGs for "total chromium" which is based on the same ratio (1:6 ratio Cr6:Cr3) that forms the basis of the cancer slope factor of 42 $(mg/kg\text{-}day)^{-1}$ presented in IRIS.

Dioxin Dioxins, furans, and some polychlorinated biphenyls are members of the same family and exhibit similar toxicological properties. Before using the dioxin PRG at an individual site, these dioxin-related compounds must be summed together. However, they differ in the degree of toxicity so that a toxicity equivalence factor (TEF) must first be applied to adjust the measured concentrations to a toxicity equivalent concentration. EPA Region 9 has adopted the 1997 World Health Organization (WHO) TEFs. For more on this, please refer to the following article (in Environmental Health Perspectives, Vol. 6, No. 12, Dec. 1998) online at: http://ehp.niehs.nih.gov/members/1998/106p775-792vandenberg/vandenberg-full.html

Lead Residential PRGs for Lead (Region 9 EPA and California EPA) are derived based on pharmacokinetic models. Both EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model and California's LeadSpread model are designed to predict the probable blood lead concentrations for children between six months and seven years of age who have been exposed to lead through various sources (air, water, soil, dust, diet and *in utero* contributions from the mother). Run in the reverse, these models also allow the user to calculate lead PRGs that are considered "acceptable" by EPA or the State of California.

EPA uses a second Adult Lead Model to estimate PRGs for an industrial setting. This PRG is intended to protect a fetus that may be carried by a pregnant female worker. It is assumed that a cleanup goal that is protective of a fetus will also afford protection for male or female adult workers. The model equations were developed to calculate cleanup goals such that there would be no more than a 5% probability that fetuses exposed to lead would exceed a blood lead (PbB) of 10 Fg/dL. An updated screening level for soil lead at commercial/industrial (i.e., non-residential) sites of 800 ppm is based on a recent analysis of the combined phases of NHANES III that chooses a cleanup goal protective of all subpopulations.

For more information on EPA's lead models and other lead-related topics, please go to:
http://www.epa.gov/oerrpage/superfund/programs/lead/

For more information on California's LeadSpread Model and Cal-Modified PRGs for lead, please go to:
http://www.dtsc.ca.gov/ScienceTechnology/ledspred.html

Manganese The IRIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet. The author of the IRIS assessment for manganese recommends that the dietary contribution from the normal U.S. diet (an upper limit of 5 mg/day) be subtracted when evaluating non-food (e.g. drinking water or soil) exposures to manganese, leading to a RfD of 0.071 mg/kg-day for non-food items. The explanatory text in IRIS further recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties that are discussed in the IRIS file for manganese, leading to a RfD of 0.024 mg/kg-day. This modified RfD is applied in the derivation of the Region 9 PRGs for soil and water. For more information regarding the Manganese RfD, you may want to contact Dr. Bob Benson at (303) 312-7070.

Nitrates/Nitrates Tap water PRGs for Nitrates/Nitrites are based on the MCL as there is no available RfD for these compounds. For more information, please see IRIS at:
http://www.epa.gov/iriswebp/iris/index.html

Thallium IRIS has many values for the different salts of thallium. However, our analytical data packages typically report "thallium". Therefore, as a practical matter it makes more sense to report a PRG for plain thallium. We have done this by making the adjustment contained in the IRIS file for thallium sulfate based on the molecular weight of the thallium in the thallium salt. The adjusted oral RfD for plain thallium is 6.6 E-05 mg/kg-day which we use to calculate a thallium PRG.

Vinyl Chloride In EPA's recent reassessment of vinyl chloride toxicity, IRIS presents two cancer slope factors for vinyl chloride (VC): one that is intended to be applied towards evaluating adult risks and a second more protective slope factor that takes into account the unique susceptibility of developing infants and young children. For residential PRGs, the Region 9 PRG Table applies the more conservative cancer potency factor that addresses exposures to both children and adults whereas for the industrial soils PRG, the adult only cancer slope factor is applied.

Because of the age-dependent vulnerability associated with vinyl chloride exposures, and due to the method that is applied in deriving the cancer slope factor for VC, an assumption of a 70 year exposure over the lifetime is assumed, consistent with the way that the toxicity value for VC was derived. Therefore, instead of the usual exposure assumption of 6 years as a child and 24 years as an adult that is assumed for carcinogenic substances, we have revised the exposure assumption for VC to 6 years as a child and 64 years as adult. Since most of the cancer risk is associated with the first 30 years of exposure to VC, there is actually little difference between a 30 year exposure assumption (typically assumed for Superfund risk assessments) and the 70 year exposure assumption that is assumed in calculating the PRG for VC.

2.4 Cal-Modified PRGs

When EPA Region 9 first came out with a Draft of the PRG Table in 1992, there was concern expressed by California EPA's Department of Toxic Substances and Control (DTSC) that for some chemicals, the risk-based concentrations that are calculated using Cal-EPA toxicity values are "significantly" more protective than the risk-based concentrations that are calculated using EPA toxicity values. Because the risk-based PRGs are order-of-magnitude estimates at best, it was agreed by both Agencies that a difference of approximately 4 or greater would be regarded as a significant difference. For chemicals with California and EPA values that differ by a factor of 4 or more, both the EPA PRGs and the "Cal-Modified PRGs" are listed in the Table.

Please note that in the State of California, Cal-Modified PRGs should be used as screening levels for contaminated sites if they are more stringent than the Federal numbers.

2.5 Soil Screening Levels

Generic, soil screening levels (SSLs) for the protection of groundwater have been included in the PRG Table for 100 of the most common contaminants at Superfund sites. Generic SSLs are derived using default values in standardized equations presented in EPA OSWER's *Soil Screening Guidance* series, available on the web at http://www.epa.gov/superfund/resources/soil/index.htm .

The SSLs were developed using a default dilution-attenuation factor (DAF) of 20 to account for natural processes that reduce contaminant concentrations in the subsurface. Also included are generic SSLs that assume no dilution or attenuation between the source and the receptor well (i.e., a DAF of 1). These values can be used at sites where little or no dilution or attenuation of soil leachate concentrations is expected at a site (e.g., sites with shallow water tables, fractured media, karst topography, or source size greater than 30 acres).

In general, if an SSL is not exceeded for the migration to groundwater pathway, the user may eliminate this pathway from further investigation.

It should be noted that in the State of California, the California Regional Water Quality Control Board has derived "California SSLs" for a number of pathways including migration to groundwater. These are not included in the Region 9 PRG Table, but may be accessed at the following website:

http://www.swrcb.ca.gov/rwqcb2/rbsl.htm

Or, for more information on the "California SSLs", please contact Dr Roger Brewer at: (510) 622-2374.

2.6 Miscellaneous

Volatile organic compounds (VOCs) are indicated by "y" in the VOC column of the Table and in general, are defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole). Three borderline chemicals (dibromochloromethane, 1,2-dibromochloropropane, and pyrene) which do not strictly meet these criteria of volatility have also been included based upon discussions with other state and federal agencies and after a consideration of vapor pressure characteristics etc. Volatile organic chemicals are evaluated for potential volatilization from soil/water to air using volatilization factors (see Section 4.4).

Chemical-specific dermal absorption values for contaminants in soil and dust are presented for arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols as recommended in the *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance* (USEPA 2004). Otherwise, default skin absorption fractions are assumed to be 0.10 for nonvolatile organics. Please note that previous defaults of 0.01 and 0.10 for inorganics and VOCs respectively, have been withdrawn per new guidance.

3.0 USE OF PRGS AT SITES

The decision to use PRGs at a site will be driven by the potential benefits of having generic risk-based concentrations in the absence of site-specific risk assessments. The original intended use of PRGs was to provide initial cleanup goals for individual chemicals given specific medium and land-use combinations (see RAGS Part B, 1991), however risk-based concentrations have several applications. They can also be used for:

- Setting health-based detection limits for chemicals of potential concern
- Screening sites to determine whether further evaluation is appropriate
- Calculating cumulative risks associated with multiple contaminants

A few basic procedures are recommended for using PRGs properly. These are briefly described below. Potential problems with the use of PRGs are also identified.

3.1 Conceptual Site Model

The primary condition for use of PRGs is that exposure pathways of concern and conditions at the site match those taken into account by the PRG framework. Thus, it is always necessary to develop a conceptual site model (CSM) to identify likely contaminant source areas, exposure pathways, and potential receptors. This information can be used to determine the applicability of PRGs at the site and the need for additional information. For those pathways not covered by PRGs, a risk assessment specific to these additional pathways may be necessary. Nonetheless, the PRG lookup values will still be useful in such situations for focusing further investigative efforts on the exposure pathways not addressed.

To develop a site-specific CSM, perform an extensive records search and compile existing data (e.g. available site sampling data, historical records, aerial photographs, and hydrogeologic information). Once this information is obtained, CSM worksheets such as those provided in ASTM's *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (1995) can be used to tailor the generic worksheet model to a site-specific CSM. The final CSM diagram represents linkages among contaminant sources, release mechanisms, exposure pathways and routes and receptors. It summarizes our understanding of the contamination problem.

As a final check, the CSM should answer the following questions:

- Are there potential ecological concerns?
- Is there potential for land use other than those covered by the PRGs (that is, residential and industrial)?
- Are there other likely human exposure pathways that were not considered in development of the PRGs (e.g. impact to groundwater, local fish consumption, raising beef, dairy, or other livestock)?
- Are there unusual site conditions (e.g. large areas of contamination, high fugitive dust levels, potential for indoor air contamination)?

If any of these four conditions exist, the PRG may need to be adjusted to reflect this new information. Suggested websites for the evaluation of pathways not currently addressed by Region 9 PRG's are presented in Exhibit 3-1.

EXHIBIT 3-1
SUGGESTED WEBSITES FOR EVALUATING EXPOSURE PATHWAYS NOT CURRENTLY ADDRESSED BY REGION 9 PRGs

EXPOSURE PATHWAY	WEBSITE
Migration of contaminants to an underlying potable aquifer	EPA Soil Screening Guidance: http://www.epa.gov/superfund/resources/soil/index.htm California Water Board Guidance: http://www.swrcb.ca.gov/rwqcb2/rbsl.htm
Ingestion via plant uptake	EPA Soil Screening Guidance: http://www.epa.gov/superfund/resources/soil/index.htm EPA Fertilizer Risk Assessment: http://www.epa.gov/epaoswer/hazwaste/recycle/fertiliz/risk/
Ingestion via meat, dairy products, human milk	EPA Protocol for Combustion Facilities: http://www.epa.gov/epaoswer/hazwaste/combust/riskvol.htm#volume1 California "Hot Spots" Risk Guidelines: http://www.oehha.ca.gov/air/hot_spots/HRSguide.html
Inhalation of volatiles that have migrated into basements or other enclosed spaces.	EPA's draft Subsurface Vapor Intrusion Guidance: http://www.epa.gov/correctiveaction/eis/vapor.htm EPA's Version of Johnson & Ettinger Model: http://www.epa.gov/oerrpage/superfund/programs/risk/airmodel/johnson_ettinger.htm
Ecological pathways	EPA Ecological Soil Screening Guidance: http://www.epa.gov/superfund/programs/risk/ecorisk/ecossl.htm NOAA Sediment Screening Table: http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

3.2 Background Levels Evaluation

A necessary step in determining the applicability of Region 9 risk-based PRGs is the consideration of background contaminant concentrations. There is new EPA guidance on determining background at sites. *Guidance for Characterizing Background Chemicals in Soil at Superfund Sites* (USEPA 2001b) is available on the web at: http://www.epa.gov/superfund/programs/risk/background.pdf .

EPA may be concerned with two types of background at sites: naturally occurring and

anthropogenic. Natural background is usually limited to metals whereas anthropogenic (i.e. human-made) "background" includes both organic and inorganic contaminants. Before embarking on an extensive sampling and analysis program to determine local background concentrations in the area, one should first compile existing data on the subject. Far too often there is pertinent information in the literature that gets ignored, resulting in needless expenditures of time and money.

Generally EPA does not clean up below natural background. In some cases, the predictive risk-based models generate PRG concentrations that lie within or even below typical background concentrations for the same element or compound. If natural background concentrations are higher than the risk-based PRG concentrations, then background concentrations should also be considered in determining whether further evaluation and/or remediation is necessary at a particular site. Exhibit 3-2 presents summary statistics for selected elements in soils that have background levels that may exceed risk-based PRGs.

Where anthropogenic "background" levels exceed PRGs and EPA has determined that a response action is necessary and feasible, EPA's goal will be to develop a comprehensive response to the widespread contamination. This will often require coordination with different authorities that have jurisdiction over the sources of contamination in the area.

EXHIBIT 3-2
BACKGROUND CONCENTRATIONS OF SELECTED ELEMENTS IN SOILS

TRACE	U.S. STUDY DATA[1]			CALIFORNIA DATA[2]		
ELEMENT	Range	GeoMean	ArMean	Range	GeoMean	ArMean
Arsenic	<.1-97	5.2 mg/kg	7.2 mg/kg	0.59-11	2.75 mg/kg	3.54 mg/kg
Beryllium	<1-15	0.63 "	0.92 "	0.10-2.7	1.14 "	1.28 "
Cadmium	<1-10	--	<1	0.05-1.7	0.26	0.36
Chromium	1-2000	37	54	23-1579	76.25	122.08
Nickel	<5-700	13	19	9.0-509	35.75	56.60

[1]Shacklette and Hansford, "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States",USGS Professional Paper 1270, 1984.

[2]Bradford et. al, "Background Concentrations of Trace and Major Elements in California Soils", Kearney Foundation Special Report, UC-Riverside and CAL-EPA DTSC, March 1996.

3.3 Screening Sites with Multiple Pollutants

A suggested stepwise approach for PRG-screening of sites with multiple pollutants is as follows:

- Perform an extensive records search and compile existing data.

- Identify site contaminants in the PRG Table. Record the PRG concentrations for various media and note whether PRG is based on cancer risk (indicated by "ca") or noncancer hazard (indicated by "nc"). Segregate cancer PRGs from non-cancer PRGs and exclude (but don't eliminate) non-risk based PRGs ("sat" or "max").

- For cancer risk estimates, take the site-specific concentration (maximum or 95 UCL) and divide by the PRG concentrations that are designated for cancer evaluation ("ca"). Multiply this ratio by 10^{-6} to estimate chemical-specific risk for a reasonable maximum exposure (RME). For multiple pollutants, simply add the risk for each chemical:

$$Risk \text{ ' } [(\frac{conc_x}{PRG_x}) \text{ \% } (\frac{conc_y}{PRG_y}) \text{ \% } (\frac{conc_z}{PRG_z})] \text{ x } 10^{\&6}$$

- For non-cancer hazard estimates. Divide the concentration term by its respective non-cancer PRG designated as "nc" and sum the ratios for multiple contaminants. The cumulative ratio represents a non-carcinogenic hazard index (HI). A hazard index of 1 or less is generally considered “safe”. A ratio greater than 1 suggests further evaluation. **[Note that carcinogens may also have an associated non-cancer PRG that is not listed in the PRG Table. To obtain these values, the user should view or download the InterCalc Tables at the PRG website and display the appropriate sections.]**

$$Hazard\ Index \text{ ' } [(\frac{conc_x}{PRG_x}) \text{ \% } (\frac{conc_y}{PRG_y}) \text{ \% } (\frac{conc_z}{PRG_z})]$$

For more information on screening site risks, the reader should contact EPA Region 9's Technical Support Section.

3. 4 Potential Problems

As with any risk-based tool, the potential exists for misapplication. In most cases the root cause will be a lack of understanding of the intended use of Region 9 PRGs. In order to prevent misuse of PRGs, the following should be avoided:

- Applying PRGs to a site without adequately developing a conceptual site model that identifies relevant exposure pathways and exposure scenarios,

- Not considering background concentrations when choosing PRGs as cleanup goals,

- Use of PRGs as cleanup levels without the nine-criteria analysis specified in the National Contingency Plan (or, comparable analysis for programs outside of Superfund),

- Use of PRGs as cleanup levels without verifying numbers with a toxicologist or regional risk assessor,

- Use of antiquated PRG Tables that have been superseded by more recent publications,

- Not considering the effects of additivity when screening multiple chemicals, and

- Adjusting PRGs upward by factors of 10 or 100 without consulting a toxicologist or regional risk assessor.

4.0 TECHNICAL SUPPORT DOCUMENTATION

Region 9 PRGs consider human exposure hazards to chemicals from contact with contaminated soils, air, and water. The emphasis of the PRG equations and technical discussion are aimed at developing screening criteria for soils, since this is an area where few standards exist. For air and water, additional reference concentrations or standards are available for many chemicals (e.g. MCLs, non-zero MCLGs, AWQC, and NAAQS) and consequently the discussion of these media are brief.

4.1 Ambient Air and the Vapor Intrusion Pathway

The ambient air PRG is applicable to both indoor and outdoors and is based on a residential exposure scenario using standard Superfund exposure factors (see Exhibit 4-1 below).

The air PRG may also be used as a health-protective indoor air target for determining soil gas and groundwater screening levels for the evaluation of the subsurface vapor intrusion pathway. The "vapor intrusion pathway" refers to the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings in ways similar to that of radon gas seeping into homes.

To derive a soil gas and/or groundwater screening level that targets the air PRG, it is necessary to divide the air PRG by an appropriate attenuation factor. The attenuation factor represents the factor by which subsurface vapor concentrations migrating into indoor air spaces are reduced due to diffusive, advective, and/or other attenuating mechanisms. The attenuation factor can be empirically determined and/or calculated using an appropriate vapor intrusion model such as the Johnson and Ettinger model available at: http://www.epa.gov/oerrpage/superfund/programs/risk/airmodel/johnson_ettinger.htm . Once the appropriate attenuation factor is determined, the following equation can be used to derive a screening level that would be protective of indoor air assuming residential land use.

For Soil Gas, the relationship is as follows:

$C_{soil\text{-}gas}[ug/m^3]$ = Air PRG $[ug/m^3]/AF$

where

$C_{soil\text{-}gas}$ = soil gas screening level
AF = attenuation factor (ratio of indoor air concentration to soil gas concentration)

For Groundwater, the relationship is as follows:

C_{gw}[ug/L] = Air PRG [ug/m^3] x 10^{-3} m^3/L x 1/H x 1/AF

where

C_{gw} = groundwater screening level
H = dimensionless Henry's Law Constant at 25C [(mg/L - vapor)/(mg/L - water)]
AF = attenuation factor (ratio of indoor air concentration to soil gas concentration)

For more information on EPA's current understanding of this emerging exposure pathway, please refer to EPA's recent draft guidance *Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (USEPA 2002) available on the web at:
http://www.epa.gov/correctiveaction/eis/vapor.htm

4.2 Soils - Direct Ingestion

Calculation of risk-based PRGs for direct ingestion of soil is based on methods presented in RAGS HHEM, Part B (USEPA 1991a) and *Soil Screening Guidance* (USEPA 1996a,b, USEPA 2001a). Briefly, these methods backcalculate a soil concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens).

Residential Soil PRGs

A number of studies have shown that inadvertent ingestion of soil is common among children 6 years old and younger (Calabrese et al. 1989, Davis et al. 1990, Van Wijnen et al. 1990). To take into account the higher soil intake rate for children, two different approaches are used to estimate PRGs, depending on whether the adverse health effect is cancer or some effect other than cancer.

For carcinogens, the method for calculating PRGs uses an age-adjusted soil ingestion factor that takes into account the difference in daily soil ingestion rates, body weights, and exposure duration for children from 1 to 6 years old and others from 7 to 31 years old. This health-protective approach is chosen to take into account the higher daily rates of soil ingestion in children as well as the longer duration of exposure that is anticipated for a long-term resident. For more on this method, see USEPA RAGs Part B (1991a).

For noncarcinogenic concerns, the more protective method of calculating a soil PRG is to evaluate childhood exposures separately from adult exposures. In other words, an age-adjustment factor is not applied as was done for carcinogens. This approach is considered conservative because it combines the higher 6-year exposure for children with chronic toxicity criteria. In their analysis of the method, the Science Advisory Board (SAB) indicated that, for most chemicals, the approach may be overly protective. However, they noted that there are specific instances when the chronic RfD may be based on endpoints of toxicity that are specific to children (e.g. fluoride and nitrates) or when the dose-response is steep (i.e., the dosage difference between the no-observed-adverse-effects level [NOAEL] and an adverse effects level is small). Thus, for the purposes of screening, EPA Region 9 has adopted this approach for calculating soil PRGs for noncarcinogenic health concerns.

Industrial Soil PRGs

In the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (Supplemental SSL Guidance, EPA 2001a), two different soil ingestion rates are assumed for non-construction workers: 100 mg/day is assumed for outdoor workers whereas 50 mg/day is assumed for indoor workers. The default value of 100 mg/day for outdoor workers is also recommended by EPA's Technical Review Workgroup for Lead (TRW), and it reflects increased exposures to soils for outdoor workers relative to their indoor counterparts. For more on this, please see the Supplemental SSL Guidance available at the following website:

http://www.epa.gov/superfund/resources/soil/index.htm

Because the Region 9 PRGs are generic and intended for screening sites early in the investigation process (often before site-specific information is available), we have chosen to use the 100 mg/day soil ingestion (i.e. outdoor worker) assumption to calculate industrial soil PRGs. The appropriateness of this assumption for a particular site may be evaluated when additional information becomes available regarding site conditions or site development.

4.3 Soils - Dermal Contact

Dermal Contact Assumptions

Exposure factors for dermal contact with soil are based on recommendations in *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance* (USEPA 2004). Recommended RME (reasonable maximum exposure) defaults for adult workers' skin surface areas (3300 cm^2/day) and soil adherence factors (0.2 mg/cm^2) now differ from the defaults recommended for adult residents (5700 cm^2/day, 0.07 mg/cm^2) as noted in Exhibit 4-1. This is due to differences in the range of activities experienced by workers versus residents.

Dermal Absorption

Chemical-specific skin absorption values recommended by the Superfund Dermal Workgroup were applied when available. Chemical-specific values are included for the following chemicals: arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols.

The *Supplemental Guidance for Dermal Risk Assessment* (USEPA 2004) recommends a default dermal absorption factor for semivolatile organic compounds of 10% as a screening method for the majority of SVOCs without dermal absorption factors. Default dermal absorption values for other chemicals (VOCs and inorganics) are not recommended in this new guidance. Therefore, the assumption of 1% for inorganics and 10% for volatiles is no longer included in the PRG Table. This change has minimal impact on the final risk-based calculations because human exposure to VOCs and inorganics in soils is generally driven by other pathways of exposure.

4.4 Soils - Vapor and Particulate Inhalation

Agency toxicity criteria indicate that risks from exposure to some chemicals via inhalation far outweigh the risk via ingestion; therefore soil PRGs have been designed to address this pathway

as well. The models used to calculate PRGs for inhalation of volatiles/particulates are based on updates to risk assessment methods presented in RAGS Part B (USEPA 1991a) and are identical to the *Soil Screening Guidance: User's Guide and Technical Background Document* (USEPA 1996a,b).

It should be noted that the soil-to-air pathway that is evaluated in the PRGs calculations is based on inhalation exposures that result from the volatilization or particulate emissions of chemicals from soil to outdoor air. **The soil PRG calculations do not evaluate potential for volatile contaminants in soil to migrate indoors. For more on the subsurface vapor intrusion pathway please see Section 4.1.**

To address the soil-to-outdoor air pathways, the PRG calculations incorporate volatilization factors (VF_s) for volatile contaminants and particulate emission factors (PEF) for nonvolatile contaminants. These factors relate soil contaminant concentrations to air contaminant concentrations that may be inhaled on-site. The VF_s and PEF equations can be broken into two separate models: an emission model to estimate emissions of the contaminant from the soil and a dispersion model to simulate the dispersion of the contaminant in the atmosphere.

The box model in RAGS Part B has been replaced with a dispersion term (Q/C) derived from a modeling exercise using meteorological data from 29 locations across the United States because the box model may not be applicable to a broad range of site types and meteorology and does not utilize state-of-the-art techniques developed for regulatory dispersion modeling. The dispersion model for both volatiles and particulates is the AREA-ST, an updated version of the Office of Air Quality Planning and Standards, Industrial Source Complex Model, ISC2. However, different Q/C terms are used in the VF and PEF equations. Los Angeles was selected as the 90th percentile data set for volatiles and Minneapolis was selected as the 90th percentile data set for fugitive dusts (USEPA 1996 a,b). A default source size of 0.5 acres was chosen for the PRG calculations. This is consistent with the default exposure area over which Region 9 typically averages contaminant concentrations in soils. If unusual site conditions exist such that the area source is substantially larger than the default source size assumed here, an alternative Q/C could be applied (see USEPA 1996a,b).

<u>Volatilization Factor for Soils</u>

Volatile chemicals, defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole, were screened for inhalation exposures using a volatilization factor for soils (VF_s). Please note that VF_s's and other physical-chemical data for VOCs are contained in the InterCalc Tables at the EPA Region 9 PRG website.

The emission terms used in the VF_s are chemical-specific and were calculated from physical-chemical information obtained from several sources. The priority of these sources were as follows: *Soil Screening Guidance* (USEPA 1996a,b), *Superfund Chemical Data Matrix* (USEPA 1996c), *Fate and Exposure Data* (Howard 1991), *Subsurface Contamination Reference Guide* (EPA 1990a), and *Superfund Exposure Assessment Manual* (SEAM, EPA 1988). When there was a choice between a measured or a modeled value (e.g. Koc), our default was to use modeled values. In those cases where Diffusivity Coefficients (Di) were not provided in existing literature, Di's were calculated using Fuller's Method described in SEAM. A surrogate term was required for some chemicals that lacked physico-chemical information. In these cases, a proxy chemical of similar structure was used that may over- or under-estimate the PRG for soils.

Equation 4-9 forms the basis for deriving generic soil PRGs for the inhalation pathway. The following parameters in the standardized equation can be replaced with specific site data to develop a simple site-specific PRG

- Source area
- Average soil moisture content
- Average fraction organic carbon content
- Dry soil bulk density

The basic principle of the VF_s model (Henry's law) is applicable only if the soil contaminant concentration is at or below soil saturation "sat". Above the soil saturation limit, the model cannot predict an accurate VF-based PRG. How these particular cases are handled, depends on whether the contaminant is liquid or solid at ambient soil temperatures (see Section 4.6).

Particulate Emission Factor for Soils

Inhalation of chemicals adsorbed to respirable particles (PM_{10}) were assessed using a default PEF equal to 1. 316 x 10^9 m^3/kg that relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils. The generic PEF was derived using default values in Equation 4-11, which corresponds to a receptor point concentration of approximately 0.76 ug/m^3. The relationship is derived by Cowherd (1985) for a rapid assessment procedure applicable to a typical hazardous waste site where the surface contamination provides a relatively continuous and constant potential for emission over an extended period of time (e.g. years). This represents an annual average emission rate based on wind erosion that should be compared with chronic health criteria; it is not appropriate for evaluating the potential for more acute exposures.

The impact of the PEF on the resultant PRG concentration (that combines soil exposure pathways for ingestion, skin contact, and inhalation) can be assessed by accessing the Region 9 PRG website and viewing the pathway-specific soil concentrations listed in the InterCalc Tables. Equation 4-11 forms the basis for deriving a generic PEF for the inhalation pathway. For more details regarding specific parameters used in the PEF model, the reader is referred to *Soil Screening Guidance: Technical Background Document* (USEPA 1996a).

Note: the generic PEF evaluates windborne emissions and does not consider dust emissions from traffic or other forms of mechanical disturbance that could lead to greater emissions than assumed here.

4.5 Soils - Migration to Groundwater

The methodology for calculating SSLs for the migration to groundwater was developed to identify chemical concentrations in soil that have the potential to contaminate groundwater. Migration of contaminants from soil to groundwater can be envisioned as a two-stage process: (1) release of contaminant in soil leachate and (2) transport of the contaminant through the underlying soil and aquifer to a receptor well. The SSL methodology considers both of these fate and transport mechanisms.

SSLs are backcalculated from acceptable ground water concentrations (i.e. nonzero MCLGs, MCLs, or risk-based PRGs). First, the acceptable groundwater concentration is multiplied by a

dilution factor to obtain a target leachate concentration. For example, if the dilution factor is 10 and the acceptable ground water concentration is 0.05 mg/L, the target soil leachate concentration would be 0.5 mg/L. The partition equation (presented in the *Soil Screening Guidance* document) is then used to calculate the total soil concentration (i.e. SSL) corresponding to this soil leachate concentration.

The SSL methodology was designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, the methodology is based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface. For more on SSLs, and how to calculate site-specific SSLs versus generic SSLs presented in the PRG Table, the reader is referred to the *Soil Screening Guidance* document (USEPA 1996a,b).

4.6 Soil Saturation Limit

The soil saturation concentration "sat" corresponds to the contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the soil contaminant may be present in free phase, i.e., nonaqueous phase liquids (NAPLs) for contaminants that are liquid at ambient soil temperatures and pure solid phases for compounds that are solid at ambient soil temperatures.

Equation 4-10 is used to calculate "sat" for each volatile contaminant. As an update to RAGS HHEM, Part B (USEPA 1991a), this equation takes into account the amount of contaminant that is in the vapor phase in soil in addition to the amount dissolved in the soil's pore water and sorbed to soil particles.

Chemical-specific "sat" concentrations must be compared with each VF-based PRG because a basic principle of the PRG volatilization model is not applicable when free-phase contaminants are present. How these cases are handled depends on whether the contaminant is liquid or solid at ambient temperatures. Liquid contaminant that have a VF-based PRG that exceeds the "sat" concentration are set equal to "sat" whereas for solids (e.g., PAHs), soil screening decisions are based on the appropriate PRGs for other pathways of concern at the site (e.g., ingestion).

4.7 Tap Water - Ingestion and Inhalation

Calculation of PRGs for ingestion and inhalation of contaminants in domestic water is based on the methodology presented in RAGS HHEM, Part B (USEPA 1991a). Ingestion of drinking water is an appropriate pathway for all chemicals. For the purposes of this guidance, however, inhalation of volatile chemicals from water is considered routinely only for chemicals with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater <u>and</u> with a molecular weight of less than 200 g/mole.

For volatile chemicals, an upperbound volatilization constant (VF_w) is used that is based on all uses of household water (e.g showering, laundering, and dish washing). Certain assumptions were made. For example, it is assumed that the volume of water used in a residence for a family of four is 720 L/day, the volume of the dwelling is 150,000 L and the air exchange rate is 0.25 air changes/hour (Andelman in RAGS Part B). Furthermore, it is assumed that the average transfer efficiency weighted by water use is 50 percent (i.e. half of the concentration of each

chemical in water will be transferred into air by all water uses). Note: the range of transfer efficiencies extends from 30% for toilets to 90% for dishwashers.

4.8 Default Exposure Factors

Default exposure factors were obtained primarily from RAGS Supplemental Guidance Standard Default *Exposure Factors* (OSWER Directive, 9285.6-03) dated March 25, 1991 and more recent information from U.S. EPA's Office of Solid Waste and Emergency Response, U.S. EPA's Office of Research and Development, and California EPA's Department of Toxic Substances Control (see Exhibit 4-1).

Because contact rates may be different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors ("adj"). Use of age-adjusted factors are especially important for soil ingestion exposures, which are higher during childhood and decrease with age. However, for purposes of combining exposures across pathways, additional age-adjusted factors are used for inhalation and dermal exposures. These factors approximate the integrated exposure from birth until age 30 combining contact rates, body weights, and exposure durations for two age groups - small children and adults. Age-adjusted factors were obtained from RAGS PART B or developed by analogy (see derivations next page).

For soils only, noncarcinogenic contaminants are evaluated in children separately from adults. No age-adjustment factor is used in this case. The focus on children is considered protective of the higher daily intake rates of soil by children and their lower body weight. For maintaining consistency when evaluating soils, dermal and inhalation exposures are also based on childhood contact rates.

(1) ingestion([mg-yr]/[kg-d]:

$$IFS_{adj} = \frac{ED_c \times IRS_c}{BW_c} + \frac{(ED_r - ED_c) \times IRS_a}{BW_a}$$

(2) skin contact([mg-yr]/[kg-d]:

$$SFS_{adj} = \frac{ED_c \times AF \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times AF \times SA_a}{BW_a}$$

(3) inhalation ([m^3-yr]/[kg-d]):

$$InhF_{adj} = \frac{ED_c \times IRA_c}{BW_c} + \frac{(ED_r - ED_c) \times IRA_a}{BW_a}$$

EXHIBIT 4-1
STANDARD DEFAULT FACTORS

Symbol	Definition (units)	Default	Reference
CSFo	Cancer slope factor oral (mg/kg-d)-1	--	IRIS, PPRTV, HEAST, NCEA, or California
CSFi	Cancer slope factor inhaled (mg/kg-d)-1	--	IRIS, PPRTV, HEAST, NCEA, or California
RfDo	Reference dose oral (mg/kg-d)	--	IRIS, PPRTV, HEAST, NCEA, or California
RfDi	Reference dose inhaled (mg/kg-d)	--	IRIS, PPRTV, HEAST, NCEA, or California
TR	Target cancer risk	10^{-6}	--
THQ	Target hazard quotient	1	--
BWa	Body weight, adult (kg)	70	RAGS (Part A), EPA 1989 (EPA/540/1-89/002)
BWc	Body weight, child (kg)	15	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
ATc	Averaging time - carcinogens (days)	25550	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
ATn	Averaging time - noncarcinogens (days)	ED*365	
SAa	Exposed surface area for soil/dust (cm^2/day)		Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– adult resident	5700	
	– adult worker	3300	
SAc	Exposed surface area, child in soil (cm^2/day)	2800	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
AFa	Adherence factor, soils (mg/cm^2)		Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– adult resident	0.07	
	– adult worker	0.2	
AFc	Adherence factor, child (mg/cm^2)	0.2	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
ABS	Skin absorption defaults (unitless):		
	– semi-volatile organics	0.1	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– volatile organics	--	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– inorganics	--	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
IRAa	Inhalation rate - adult (m^3/day)	20	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRAc	Inhalation rate - child (m^3/day)	10	Exposure Factors, EPA 1997 (EPA/600/P-95/002Fa)
IRWa	Drinking water ingestion - adult (L/day	2	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
IRWc	Drinking water ingestion - child (L/day)	1	PEA, Cal-EPA (DTSC, 1994)
IRSa	Soil ingestion - adult (mg/day)	100	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSc	Soil ingestion - child (mg/day),	200	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSo	Soil ingestion - occupational (mg/day)	100	Soil Screening Guidance (EPA 2001a)
EFr	Exposure frequency - residential (d/y)	350	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EFo	Exposure frequency - occupational (d/y)	250	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDr	Exposure duration - residential (years)	30[a]	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDc	Exposure duration - child (years)	6	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDo	Exposure duration - occupational (years)	25	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
	Age-adjusted factors for carcinogens:		
IFSadj	Ingestion factor, soils ([mg-yr]/[kg-d])	114	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
SFSadj	Dermal factor, soils ([mg-yr]/[kg-d])	361	By analogy to RAGS (Part B)
InhFadj	Inhalation factor, air ([m^3-yr]/[kg-d])	11	By analogy to RAGS (Part B)
IFWadj	Ingestion factor, water ([L-yr]/[kg-d])	1.1	By analogy to RAGS (Part B)
VFw	Volatilization factor for water (L/m^3)	0.5	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
PEF	Particulate emission factor (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
VFs	Volatilization factor for soil (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
sat	Soil saturation concentration (mg/kg)	See below	Soil Screening Guidance (EPA 1996a,b)

Footnote:
[a]Exposure duration for lifetime residents is assumed to be 30 years total. For carcinogens, exposures are combined for children (6 years) and adults (24 years) .

4.9 Standardized Equations

The equations used to calculate the PRGs for carcinogenic and noncarcinogenic contaminants are presented in Equations 4-1 through 4-8. The PRG equations update RAGS Part B equations. The methodology backcalculates a soil, air, or water concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens). For completeness, the soil equations combine risks from ingestion, skin contact, and inhalation simultaneously. **Note: the InterCalc Tables available at the EPA Region 9 PRG website also includes pathway-specific concentrations, should the user decide against combining specific exposure pathways; or, the user wants to identify the relative contribution of each pathway to exposure.**

To calculate PRGs for volatile chemicals in soil, a chemical-specific volatilization factor is calculated per Equation 4-9. Because of its reliance on Henry's law, the VF_s model is applicable only when the contaminant concentration in soil is at or below saturation (i.e. there is no free-phase contaminant present). Soil saturation ("sat") corresponds to the contaminant concentration in soil at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above this point, pure liquid-phase contaminant is expected in the soil. If the PRG calculated using VF_s was greater than the calculated sat, the PRG was set equal to sat, in accordance with *Soil Screening Guidance* (USEPA 1996 a,b). The equation for deriving sat is presented in Equation 4-10.

PRG EQUATIONS

Soil Equations: For soils, equations were based on three exposure routes (ingestion, skin contact, and inhalation).

Equation 4-1: Combined Exposures to Carcinogenic Contaminants in Residential Soil

$$C(mg/kg) \text{ '} \frac{TR \times AT_c}{EF_r \left[\left(\frac{IFS_{adj} \times CSF_o}{10^6 mg/kg} \right) \% \left(\frac{SFS_{adj} \times ABS \times CSF_o}{10^6 mg/kg} \right) \% \left(\frac{InhF_{adj} \times CSF_i}{VF_s^a} \right) \right]}$$

Equation 4-2: Combined Exposures to Noncarcinogenic Contaminants in Residential Soil

$$C(mg/kg) \text{ '} \frac{THQ \times BW_c \times AT_n}{EF_r \times ED_c \left[\left(\frac{1}{RfD_o} \times \frac{IRS_c}{10^6 mg/kg} \right) \% \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times ABS}{10^6 mg/kg} \right) \% \left(\frac{1}{RfD_i} \times \frac{IRA_c}{VF_s^a} \right) \right]}$$

Equation 4-3: Combined Exposures to Carcinogenic Contaminants in Industrial Soil

$$C(mg/kg) \text{ '} \frac{TR \times BW_a \times AT_c}{EF_o \times ED_o \left[\left(\frac{IRS_o \times CSF_o}{10^6 mg/kg} \right) \% \left(\frac{SA_a \times AF \times ABS \times CSF_o}{10^6 mg/kg} \right) \% \left(\frac{IRA_a \times CSF_i}{VF_s^a} \right) \right]}$$

Footnote:
[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

Equation 4-4: Combined Exposures to Noncarcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{THQ \times BW_a \times AT_n}{EF_o \times ED_o\left[\left(\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_a \times AF \times ABS}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_i} \times \frac{IRA_a}{VF_s{}^a}\right)\right]}$$

Tap Water Equations:

Equation 4-5: Ingestion and Inhalation Exposures to Carcinogenic Contaminants in Water

$$C(ug/L) = \frac{TR \times AT_c \times 1000 ug/mg}{EF_r\left[(IFW_{adj} \times CSF_o) + (VF_w \times InhF_{adj} \times CSF_i)\right]}$$

Equation 4-6: Ingestion and Inhalation Exposures to Noncarcinogenic Contaminants in Water

$$C(ug/L) = \frac{THQ \times BW_a \times AT_n \times 1000 ug/mg}{EF_r \times ED_r\left[\left(\frac{IRW_a}{RfD_o}\right) + \left(\frac{VF_w \times IRA_a}{RfD_i}\right)\right]}$$

Air Equations:

Equation 4-7: Inhalation Exposures to Carcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{TR \times AT_c \times 1000 ug/mg}{EF_r \times InhF_{adj} \times CSF_i}$$

Equation 4-8: Inhalation Exposures to Noncarcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{THQ \times RfD_i \times BW_a \times AT_n \times 1000 ug/mg}{EF_r \times ED_r \times IRA_a}$$

Footnote:
[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

SOIL-TO-AIR VOLATILIZATION FACTOR (VF_s)

Equation 4-9: Derivation of the Volatilization Factor

$$VF_s(m^3/kg) = (Q/C) \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4}(m^2/cm^2)$$

where:

$$D_A = \frac{[(\Theta_a^{10/3} D_i H) + \Theta_w^{10/3} D_w)/n^2]}{\rho_B K_d + \Theta_w + \Theta_a H)}$$

Parameter	Definition (units)	Default
VF_s	Volatilization factor (m^3/kg)	--
D_A	Apparent diffusivity (cm^2/s)	--
Q/C	Inverse of the mean conc. at the center of a 0.5-acre square source ($g/^{M2}$-s per kg/m^3)	68.81
T	Exposure interval (s)	9.5×10^8
ρ_b	Dry soil bulk density (g/cm^3)	1.5
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
ρ_s	Soil particle density (g/cm^3)	2.65
Di	Diffusivity in air (cm^2/s)	Chemical-specific
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	Calculated from H by multiplying by 41 (USEPA 1991a)
D_w	Diffusivity in water (cm^2/s)	Chemical-specific
K_d	Soil-water partition coefficient (cm^3/g) = $K_{oc}f_{oc}$	Chemical-specific
K_{oc}	Soil organic carbon-water partition coefficient (cm^3/g)	Chemical-specific
f_{oc}	Fraction organic carbon in soil (g/g)	0.006 (0.6%)

SOIL SATURATION CONCENTRATION (sat)

Equation 4-10: Derivation of the Soil Saturation Limit

$$sat = \frac{S}{\rho_b}\left(K_d\rho_b + \Theta_w + H'\Theta_a\right)$$

Parameter	Definition (units)	Default
sat	Soil saturation concentration (mg/kg)	--
S	Solubility in water (mg/L-water)	Chemical-specific
ρ_b	Dry soil bulk density (kg/L)	1.5
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
ρ_s	Soil particle density (kg/L)	2.65
K_d	Soil-water partition coefficient (L/kg)	K_{oc} x f_{oc} (chemical-specific)
k_{oc}	Soil organic carbon/water partition coefficient (L/kg)	Chemical-specific
f_{oc}	Fraction organic carbon content of soil (g/g)	0.006 or site-specific
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
w	Average soil moisture content (kg_{water}/kg_{soil} or L_{water}/kg_{soil})	0.1
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	H x 41, where 41 is a units conversion factor

Equation 4-11: Derivation of the Particulate Emission Factor

$$PEF(m^3/kg) \text{ ' } Q/C \times \frac{3600 s/h}{0.036 \times (1\&V) \times (U_m/U_t)^3 \times F(x)}$$

Parameter	Definition (units)	Default
PEF	Particulate emission factor (m^3/kg)	1.316×10^9
Q/C	Inverse of the mean concentration at the center of a 0.5-acre-square source (g/^{M2}-s per kg/m^3)	90.80
V	Fraction of vegetative cover (unitless)	0.5
U_m	Mean annual windspeed (m/s)	4.69
U_t	Equivalent threshold value of windspeed at 7 m (m/s)	11.32
F(x)	Function dependent on U_m/U_t derived using Cowherd (1985) (unitless)	0.194

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Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG)
ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.7E-03	i	4.0E-03	i	8.7E-03	r	4.0E-03	r		0.1	30560-19-1	Acephate	5.6E+01	ca**	2.0E+02	ca*	7.7E-01	ca*	7.7E+00	ca*		
				7.7E-03	i	2.6E-03	i	y		75-07-0	Acetaldehyde	1.1E+01	ca**	2.3E+01	ca**	8.7E-01	ca*	1.7E+00	ca		
		2.0E-02	i			2.0E-02	r		0.1	34256-82-1	Acetochlor	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		9.0E-01	i			9.0E-01	r	y		67-64-1	**Acetone**	1.4E+04	nc	5.4E+04	nc	3.3E+03	nc	5.5E+03	nc	1.6E+01	8.0E-01
		8.0E-04	h			8.0E-04	r		0.1	75-86-5	Acetone cyanohydrin	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
		1.7E-02	r			1.7E-02	i	y		75-05-8	Acetonitrile	4.2E+02	nc	1.8E+03	nc	6.2E+01	nc	1.0E+02	nc		
		5.0E-04	i			5.7E-06	i	y		107-02-8	**Acrolein**	1.0E-01	nc	3.4E-01	nc	2.1E-02	nc	4.2E-02	nc		
4.5E+00	i	2.0E-04	i	4.5E+00	i	2.0E-04	r		0.1	79-06-1	Acrylamide	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
		5.0E-01	i			2.9E-04	i		0.1	79-10-7	Acrylic acid	2.9E+04	nc	1.0E+05	max	1.0E+00	nc	1.8E+04	nc		
5.4E-01	i	1.0E-03	h	2.4E-01	i	5.7E-04	i	y		107-13-1	Acrylonitrile	2.1E-01	ca*	4.9E-01	ca*	2.8E-02	ca*	3.9E-02	ca*		
1.0E+00	r			1.0E+00	c			y			**"CAL-Modified PRG"**	5.5E-02	ca	1.2E-01	ca	6.7E-03	ca	1.1E-02	ca		
8.1E-02	h	1.0E-02	i	8.0E-02	r	1.0E-02	r		0.1	15972-60-8	Alachlor	6.0E+00	ca	2.1E+01	ca	8.4E-02	ca	8.4E-01	ca		
		1.5E-01	i			1.5E-01	r		0.1	1596-84-5	Alar	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		1.0E-03	i			1.0E-03	r		0.1	116-06-3	Aldicarb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	i			1.0E-03	r		0.1	1646-88-4	Aldicarb sulfone	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
1.7E+01	i	3.0E-05	i	1.7E+01	i	3.0E-05	r		0.1	309-00-2	Aldrin	2.9E-02	ca*	1.0E-01	ca	3.9E-04	ca	4.0E-03	ca	5.0E-01	2.0E-02
		2.5E-01	i			2.5E-01	r		0.1	74223-64-6	Ally	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	107-18-6	Allyl alcohol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.9E-04	r			2.9E-04	i		0.1	107-05-1	**Allyl chloride**	1.7E+01	nc	1.8E+02	nc	1.0E+00	nc	1.0E+01	nc		
		1.0E+00	p			1.4E-03	p			7429-90-5	Aluminum	7.6E+04	nc	1.0E+05	max	5.1E+00	nc	3.6E+04	nc		
		4.0E-04	i							20859-73-8	Aluminum phosphide	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc		
		3.0E-04	i			3.0E-04	r		0.1	67485-29-4	Amdro	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		9.0E-03	i			9.0E-03	r		0.1	834-12-8	Ametryn	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		2.0E-04	n			2.0E-04	r		0.1	1321-12-6	**Aminodinitrotoluene**	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
		7.0E-02	h			7.0E-02	r		0.1	591-27-5	m-Aminophenol	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-05	h			2.0E-05	r		0.1	504-24-5	4-Aminopyridine	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		2.5E-03	i			2.5E-03	r		0.1	33089-61-1	Amitraz	1.5E+02	nc	1.5E+03	nc	9.1E+00	nc	9.1E+01	nc		
						2.9E-02	i			7664-41-7	Ammonia					1.0E+02	nc				
		2.0E-01	i						0.1	7773-06-0	Ammonium sulfamate	1.2E+04	nc	1.0E+05	max			7.3E+03	nc		
5.7E-03	i	7.0E-03	p	5.7E-03	r	2.9E-04	i		0.1	62-53-3	Aniline	8.5E+01	ca**	3.0E+02	ca*	1.0E+00	nc	1.2E+01	ca*		
		4.0E-04	i							7440-36-0	Antimony and compounds	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc	5.0E+00	3.0E-01
		1.3E-02	i			1.3E-02	r		0.1	74115-24-5	Apollo	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
2.5E-02	i	5.0E-02	h	2.5E-02	i	5.0E-02	r		0.1	140-57-8	Aramite	1.9E+01	ca	6.9E+01	ca	2.7E-01	ca	2.7E+00	ca		
1.5E+00	i	3.0E-04	i	1.5E+01	i				0.03	7440-38-2	Arsenic	3.9E-01	ca*	1.6E+00	ca	4.5E-04	ca	4.5E-02	ca	2.9E+01	1.0E+00
9.5E+00	c			1.2E+01	c				0.03		**"CAL-Modified PRG"**	6.2E-02	ca	2.5E-01	ca	5.6E-04	ca	7.1E-03	ca		
						1.4E-05	i			7784-42-1	Arsine (see arsenic for cancer endpoint)					5.2E-02	nc				
		9.0E-03	i			9.0E-03	r		0.1	76578-14-8	Assure	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		5.0E-02	i			5.0E-02	r		0.1	3337-71-1	Asulam	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
2.2E-01	h	3.5E-02	i	2.2E-01	r	3.5E-02	r		0.1	1912-24-9	Atrazine	2.2E+00	ca	7.8E+00	ca	3.1E-02	ca	3.0E-01	ca		
		4.0E-04	i			4.0E-04	r		0.1	71751-41-2	Avermectin B1	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.1E-01	i			1.1E-01	i				0.1	103-33-3	Azobenzene	4.4E+00	ca	1.6E+01	ca	6.2E-02	ca	6.1E-01	ca		
		7.0E-02	i			1.4E-04	h			7440-39-3	Barium and compounds	5.4E+03	nc	6.7E+04	nc	5.2E-01	nc	2.6E+03	nc	1.6E+03	8.2E+01

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		4.0E-03	i			4.0E-03	r		0.1	114-26-1	Baygon	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		3.0E-02	i			3.0E-02	r		0.1	43121-43-3	Bayleton	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r		0.1	68359-37-5	Baythroid	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-01	i			3.0E-01	r		0.1	1861-40-1	Benefin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		5.0E-02	i			5.0E-02	r		0.1	17804-35-2	Benomyl	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		3.0E-02	i			3.0E-02	r		0.1	25057-89-0	Bentazon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-01	i			1.0E-01	r		0.1	100-52-7	Benzaldehyde	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
5.5E-02	i	4.0E-03	i	2.7E-02	i	8.6E-03	i	y		71-43-2	**Benzene**	6.4E-01	ca*	1.4E+00	ca*	2.5E-01	ca	3.5E-01	ca	3.0E-02	2.0E-03
2.3E+02	i	3.0E-03	i	2.3E+02	i	3.0E-03	r		0.1	92-87-5	Benzidine	2.1E-03	ca	7.5E-03	ca	2.9E-05	ca	2.9E-04	ca		
		4.0E+00	i			4.0E+00	r		0.1	65-85-0	Benzoic acid	1.0E+05	max	1.0E+05	max	1.5E+04	nc	1.5E+05	nc	4.0E+02	2.0E+01
1.3E+01	i			1.3E+01	r				0.1	98-07-7	Benzotrichloride	3.7E-02	ca	1.3E-01	ca	5.2E-04	ca	5.2E-03	ca		
		3.0E-01	h			3.0E-01	r		0.1	100-51-6	Benzyl alcohol	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
1.7E-01	i	2.9E-03	r	1.7E-01	r	2.9E-03	n	y		100-44-7	Benzyl chloride	8.9E-01	ca*	2.2E+00	ca	4.0E-02	ca	6.6E-02	ca		
		2.0E-03	i	8.4E+00	i	5.7E-06	i			7440-41-7	Beryllium and compounds	1.5E+02	nc	1.9E+03	ca**	8.0E-04	ca*	7.3E+01	nc	6.3E+01	3.0E+00
		1.0E-04	i			1.0E-04	r		0.1	141-66-2	Bidrin	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.5E-02	i			1.5E-02	r		0.1	82657-04-3	Biphenthrin (Talstar)	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		5.0E-02	i			5.0E-02	r	y		92-52-4	**1,1-Biphenyl**	3.0E+03	nc	2.3E+04	nc	1.8E+02	nc	3.0E+02	nc		
1.1E+00	i			1.1E+00	i			y		111-44-4	Bis(2-chloroethyl)ether	2.2E-01	ca	5.8E-01	ca	6.1E-03	ca	1.0E-02	ca	4.0E-04	2.0E-05
7.0E-02	x	4.0E-02	i	3.5E-02	x	4.0E-02	r	y		108-60-1	Bis(2-chloroisopropyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
2.2E+02	i			2.2E+02	i			y		542-88-1	Bis(chloromethyl)ether	1.9E-04	ca	4.3E-04	ca	3.1E-05	ca	5.2E-05	ca		
7.0E-02	x	4.0E-02	i	3.5E-02	x	4.0E-02	r	y		108-60-1	Bis(2-chloro-1-methylethyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
1.4E-02	i	2.0E-02	i	1.4E-02	r	2.0E-02	r		0.1	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.5E+01	ca*	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.0E-02	i			5.0E-02	r		0.1	80-05-7	Bisphenol A	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.00E-01	i			5.7E-03	h			7440-42-8	Boron	1.6E+04	nc	1.0E+05	max	2.1E+01	nc	7.3E+03	nc		
						2.0E-04	h			7637-07-2	Boron trifluoride					7.3E-01	nc				
7.0E-01	i	4.0E-03	i	7.0E-01	r	4.0E-03	r		0.1	15541-45-4	**Bromate**	6.9E-01	ca	2.5E+00	ca	9.6E-03	ca	9.6E-02	ca		
		2.0E-02	p			2.9E-03	p	y		108-86-1	Bromobenzene	2.8E+01	nc	9.2E+01	nc	1.0E+01	nc	2.0E+01	nc		
6.2E-02	i	2.0E-02	i	6.2E-02	r	2.0E-02	r	y		75-27-4	Bromodichloromethane	8.2E-01	ca	1.8E+00	ca	1.1E-01	ca	1.8E-01	ca	6.0E-01	3.0E-02
7.9E-03	i	2.0E-02	i	3.9E-03	i	2.0E-02	r		0.1	75-25-2	Bromoform (tribromomethane)	6.2E+01	ca*	2.2E+02	ca*	1.7E+00	ca*	8.5E+00	ca*	8.0E-01	4.0E-02
		1.4E-03	i			1.4E-03	i	y		74-83-9	Bromomethane (Methyl bromide)	3.9E+00	nc	1.3E+01	nc	5.2E+00	nc	8.7E+00	nc	2.0E-01	1.0E-02
		5.0E-03	h			5.0E-03	r		0.1	2104-96-3	Bromophos	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r		0.1	1689-84-5	Bromoxynil	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r		0.1	1689-99-2	Bromoxynil octanoate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
1.1E-01	r	5.7E-04	r	1.1E-01	i	5.7E-04	i	y		106-99-0	**1,3-Butadiene**	5.8E-02	ca*	1.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		
6.0E-01	r	5.7E-03	r	6.0E-01	c	5.7E-03	c	y		106-99-0	**"CAL-Modified PRG"**	1.1E-02	ca	2.3E-02	ca	1.1E-02	ca	1.9E-02	ca		
		1.0E-01	i			2.6E-03	n		0.1	71-36-3	1-Butanol	6.1E+03	nc	6.1E+04	nc	9.5E+00	nc	3.6E+03	nc	1.7E+01	9.0E-01
		5.0E-02	i			5.0E-02	r		0.1	2008-41-5	Butylate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-02	n			4.0E-02	r	y		104-51-8	n-Butylbenzene	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.0E-02	n			4.0E-02	r	y		135-9-88	sec-Butylbenzene	2.2E+02	sat	2.2E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.0E-02	n			4.0E-02	r	y		98-06-6	tert-Butylbenzene	3.9E+02	sat	3.9E+02	sat	1.5E+02	nc	2.4E+02	nc		
		2.0E-01	i			2.0E-01	r		0.1	85-68-7	Butyl benzyl phthalate	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc	9.3E+02	8.1E+02
		1.0E+00	i			1.0E+00	r		0.1	85-70-1	Butylphthalyl butylglycolate	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		

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ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-04	i	6.3E+00	i				0.001	7440-43-9	Cadmium and compounds	3.7E+01	nc	4.5E+02	nc	1.1E-03	ca	1.8E+01	nc	8.0E+00	4.0E-01
		5.0E-01	i			5.0E-01	r		0.1	105-60-2	Caprolactam	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
8.6E-03	h	2.0E-03	i	8.6E-03	r	2.0E-03	r		0.1	2425-06-1	Captafol	5.7E+01	ca**	2.0E+02	ca**	7.8E-01	ca**	7.8E+00	ca**		
3.5E-03	h	1.3E-01	i	3.5E-03	r	1.3E-01	r		0.1	133-06-2	Captan	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
		1.0E-01	i			1.1E-01	r		0.1	63-25-2	Carbaryl	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
2.0E-02	h			2.0E-02	r				0.1	86-74-8	Carbazole	2.4E+01	ca	8.6E+01	ca	3.4E-01	ca	3.4E+00	ca	6.0E-01	3.0E-02
		5.0E-03	i			5.0E-03	r		0.1	1563-66-2	Carbofuran	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-01	i			2.0E-01	i	y		75-15-0	Carbon disulfide	3.6E+02	nc	7.2E+02	sat	7.3E+02	nc	1.0E+03	nc	3.2E+01	2.0E+00
1.3E-01	i	7.0E-04	i	5.3E-02	i	7.0E-04	r	y		56-23-5	Carbon tetrachloride	2.5E-01	ca**	5.5E-01	ca*	1.3E-01	ca*	1.7E-01	ca*	7.0E-02	3.0E-03
		1.0E-02	i			1.0E-02	r		0.1	55285-14-8	Carbosulfan	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-01	i			1.0E-01	r		0.1	5234-68-4	Carboxin	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		1.5E-02	i			1.5E-02	r		0.1	133-90-4	Chloramben	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
4.0E-01	h			4.0E-01	r				0.1	118-75-2	Chloranil	1.2E+00	ca	4.3E+00	ca	1.7E-02	ca	1.7E-01	ca		
3.5E-01	i	5.0E-04	i	3.5E-01	i	2.0E-04	i		0.04	12789-03-6	Chlordane (technical)	1.6E+00	ca*	6.5E+00	ca*	1.9E-02	ca*	1.9E-01	ca*	1.0E+01	5.0E-01
		2.0E-02	i			2.0E-02	r		0.1	90982-32-4	Chlorimuron-ethyl	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			5.7E-05	n			7782-50-5	Chlorine					2.1E-01	nc				
		3.0E-02	i			5.7E-05	i			10049-04-4	Chlorine dioxide					2.1E-01	nc				
		2.0E-03	h			2.0E-03	r		0.1	79-11-8	Chloroacetic acid	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.6E-06	r			8.6E-06	i	y		532-27-4	2-Chloroacetophenone	3.3E-02	nc	1.1E-01	nc	3.1E-02	nc	5.2E-02	nc		
		4.0E-03	i			4.0E-03	r		0.1	106-47-8	4-Chloroaniline	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc	7.0E-01	3.0E-02
		2.0E-02	i			1.7E-02	n	y		108-90-7	Chlorobenzene	1.5E+02	nc	5.3E+02	nc	6.2E+01	nc	1.1E+02	nc	1.0E+00	7.0E-02
2.7E-01	h	2.0E-02	i	2.7E-01	h	2.0E-02	r		0.1	510-15-6	Chlorobenzilate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-01	h			2.0E-01	r		0.1	74-11-3	p-Chlorobenzoic acid	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	h			2.0E-02	r		0.1	98-56-6	4-Chlorobenzotrifluoride	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	h			2.0E-03	h	y		126-99-8	2-Chloro-1,3-butadiene	3.6E+00	nc	1.2E+01	nc	7.3E+00	nc	1.4E+01	nc		
		4.0E-01	h			4.0E-01	r	y		109-69-3	1-Chlorobutane	4.8E+02	sat	4.8E+02	sat	1.5E+03	nc	2.4E+03	nc		
		1.4E+01	r			1.4E+01	i	y		75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	3.4E+02	sat	3.4E+02	sat	5.2E+04	nc	8.7E+04	nc		
		1.4E+01	r			1.4E+01	i	y		75-45-6	Chlorodifluoromethane	3.4E+02	sat	3.4E+02	sat	5.1E+04	nc	8.5E+04	nc		
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	i	y		75-00-3	Chloroethane	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		1.0E-02	i	8.1E-02	i	1.4E-02	n	y		67-66-3	**Chloroform**	2.2E-01	ca	4.7E-01	ca	8.3E-02	ca	1.7E-01	ca	6.0E-01	3.0E-02
3.1E-02	c			1.9E-02	c			y			"CAL-Modified PRG"	9.4E-01	ca	2.0E+00	ca	3.5E-01	ca	5.3E-01	ca		
		2.6E-02	r			2.6E-02	i	y		74-87-3	**Chloromethane (methyl chloride)**	4.7E+01	nc	1.6E+02	nc	9.5E+01	nc	1.6E+02	nc		
5.8E-01	h			5.8E-01	r				0.1	95-69-2	4-Chloro-2-methylaniline	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
4.6E-01	h			4.6E-01	r				0.1	3165-93-3	4-Chloro-2-methylaniline hydrochloride	1.1E+00	ca	3.7E+00	ca	1.5E-02	ca	1.5E-01	ca		
		8.0E-02	i			8.0E-02	r	y		91-58-7	beta-Chloronaphthalene	4.9E+03	nc	2.3E+04	nc	2.9E+02	nc	4.9E+02	nc		
9.7E-03	p	1.0E-03	p	9.7E-03	r	2.0E-05	p	y		88-73-3	o-Chloronitrobenzene	1.4E+00	nc**	4.5E+00	nc**	7.3E-02	nc**	1.5E-01	nc**		
6.7E-03	p	1.0E-03	p	6.7E-03	r	1.7E-04	p	y		100-00-5	p-Chloronitrobenzene	1.0E+01	nc**	3.7E+01	nc**	6.2E-01	nc**	1.2E+00	nc**		
		5.0E-03	i			5.0E-03	r	y		95-57-8	2-Chlorophenol	6.3E+01	nc	2.4E+02	nc	1.8E+01	nc	3.0E+01	nc	4.0E+00	2.0E-01
		2.9E-02	r			2.9E-02	h	y		75-29-6	2-Chloropropane	1.7E+02	nc	5.9E+02	nc	1.0E+02	nc	1.7E+02	nc		
1.1E-02	h	1.5E-02	i	1.1E-02	r	1.5E-02	r		0.1	1897-45-6	Chlorothalonil	4.4E+01	ca*	1.6E+02	ca*	6.1E-01	ca*	6.1E+00	ca*		
		2.0E-02	i			2.0E-02	r	y		95-49-8	o-Chlorotoluene	1.6E+02	nc	5.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
		2.0E-01	i			2.0E-01	r		0.1	101-21-3	Chlorpropham	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		

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TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		3.0E-03	i			3.0E-03	r		0.1	2921-88-2	Chlorpyrifos	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.0E-02	h			1.0E-02	r		0.1	5598-13-0	Chlorpyrifos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	i			5.0E-02	r		0.1	64902-72-3	Chlorsulfuron	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		8.0E-04	h			8.0E-04	r		0.1	60238-56-4	Chlorthiophos	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
				4.2E+01	i						Total Chromium (1:6 ratio Cr VI:Cr III)+++	2.1E+02	ca	4.5E+02	ca	1.6E-04	ca			3.8E+01	2.0E+00
		1.5E+00	i							16065-83-1	Chromium III	1.0E+05	max	1.0E+05	max			5.5E+04	nc		
		3.0E-03	i	2.9E+02	i	2.2E-06	i			18540-29-9	Chromium VI+++	3.0E+01	ca**	6.4E+01	ca	2.3E-05	ca	1.1E+02	nc	3.8E+01	2.0E+00
		2.0E-02	p	9.8E+00	p	5.7E-06	p			7440-48-4	Cobalt	9.0E+02	ca**	1.9E+03	ca*	6.9E-04	ca*	7.3E+02	nc		
				2.2E+00	i					8007-45-2	Coke Oven Emissions					3.1E-03	ca				
		4.0E-02	h							7440-50-8	Copper and compounds	3.1E+03	nc	4.1E+04	nc			1.5E+03	nc		
1.9E+00	h			1.9E+00	r			y		123-73-9	Crotonaldehyde	5.3E-03	ca	1.1E-02	ca	3.5E-03	ca	5.9E-03	ca		
		1.0E-01	i			1.1E-01	i	y		98-82-8	Cumene (isopropylbenzene)	5.7E+02	nc	2.0E+03	nc	4.0E+02	nc	6.6E+02	nc		
8.4E-01	h	2.0E-03	h	8.4E-01	r	2.0E-03	r		0.1	21725-46-2	Cyanazine	5.8E-01	ca	2.1E+00	ca	8.0E-03	ca	8.0E-02	ca		
		2.0E-02	i						0.1	57-12-5	Cyanide (free)	1.2E+03	nc	1.2E+04	nc			7.3E+02	nc		
		2.0E-02	i			8.6E-04	i	y		74-90-8	Cyanide (hydrogen)	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		
		4.0E-02	i			4.0E-02	r	y		460-19-5	Cyanogen	1.3E+02	nc	4.3E+02	nc	1.5E+02	nc	2.4E+02	nc		
		9.0E-02	i			9.0E-02	r	y		506-68-3	Cyanogen bromide	2.9E+02	nc	9.7E+02	nc	3.3E+02	nc	5.5E+02	nc		
		5.0E-02	i			5.0E-02	r	y		506-77-4	Cyanogen chloride	1.6E+02	nc	5.4E+02	nc	1.8E+02	nc	3.0E+02	nc		
		1.7E+00	r			1.7E+00	i	y		110-82-7	**Cyclohexane**	1.4E+02	sat	1.4E+02	sat	6.2E+03	nc	1.0E+04	nc		
		5.0E+00	i			5.0E+00	r		0.1	108-94-1	Cyclohexanone	1.0E+05	max	1.0E+05	max	1.8E+04	nc	1.8E+05	nc		
		2.0E-01	i			2.0E-01	r		0.1	108-91-8	Cyclohexylamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	68085-85-8	Cyhalothrin/Karate	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-02	i			1.0E-02	r		0.1	52315-07-8	Cypermethrin	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		7.5E-03	i			7.5E-03	r		0.1	66215-27-8	Cyromazine	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.0E-02	i			1.0E-02	r		0.1	1861-32-1	Dacthal	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		3.0E-02	i			3.0E-02	r		0.1	75-99-0	Dalapon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r		0.1	39515-41-8	Danitol	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
2.4E-01	i			2.4E-01	r				0.03	72-54-8	DDD	2.4E+00	ca	1.0E+01	ca	2.8E-02	ca	2.8E-01	ca	1.6E+01	8.0E-01
3.4E-01	i			3.4E-01	r				0.03	72-55-9	DDE	1.7E+00	ca	7.0E+00	ca	2.0E-02	ca	2.0E-01	ca	5.4E+01	3.0E+00
3.4E-01	i	5.0E-04	i	3.4E-01	i	5.0E-04	r		0.03	50-29-3	DDT	1.7E+00	ca*	7.0E+00	ca*	2.0E-02	ca*	2.0E-01	ca*	3.2E+01	2.0E+00
		1.0E-02	i			1.0E-02	r		0.1	1163-19-5	Decabromodiphenyl ether	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		4.0E-05	i			4.0E-05	r		0.1	8065-48-3	Demeton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc		
6.1E-02	h			6.1E-02	r				0.1	2303-16-4	Diallate	8.0E+00	ca	2.8E+01	ca	1.1E-01	ca	1.1E+00	ca		
		9.0E-04	h			9.0E-04	r		0.1	333-41-5	Diazinon	5.5E+01	nc	5.5E+02	nc	3.3E+00	nc	3.3E+01	nc		
		2.0E-03	n			2.0E-03	r	y		132-64-9	**Dibenzofuran**	1.5E+02	nc	1.6E+03	nc	7.3E+00	nc	1.2E+01	nc		
		1.0E-02	i			1.0E-02	r		0.1	106-37-6	1,4-Dibromobenzene	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.4E-02	i	2.0E-02	i	8.4E-02	r	2.0E-02	r	y		124-48-1	Dibromochloromethane	1.1E+00	ca	2.6E+00	ca	8.0E-02	ca	1.3E-01	ca	4.0E-01	2.0E-02
1.4E+00	h	5.7E-05	r	2.4E-03	x	5.7E-05	i	y		96-12-8	**1,2-Dibromo-3-chloropropane (DBCP)**	4.6E-01	ca**	2.0E+00	ca**	2.1E-01	nc	4.8E-02	ca**		
7.0E+00	c			7.0E+00	c			y		96-12-8	**"CAL-Modified PRG"**	3.0E-02	ca	7.6E-02	ca	9.6E-04	ca	1.6E-03	ca		
2.0E+00	i	9.0E-03	i	2.0E+00	i	2.6E-03	i	y		106-93-4	**1,2-Dibromoethane (EDB)**	3.2E-02	ca	7.3E-02	ca	3.4E-03	ca	5.6E-03	ca		
		1.0E-01	i			1.0E-01	r		0.1	84-74-2	Dibutyl phthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.3E+03	2.7E+02
		3.0E-02	i			3.0E-02	r		0.1	1918-00-9	Dicamba	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG)
ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		9.0E-02	i			5.7E-02	h	y		95-50-1	**1,2-Dichlorobenzene**	6.0E+02	sat	6.0E+02	sat	2.1E+02	nc	3.7E+02	nc	1.7E+01	9.0E-01
		3.0E-02	n			3.0E-02	r	y		541-73-1	**1,3-Dichlorobenzene**	5.3E+02	nc	6.0E+02	sat	1.1E+02	nc	1.8E+02	nc		
2.4E-02	h	3.0E-02	n	2.2E-02	n	2.3E-01	i	y		106-46-7	1,4-Dichlorobenzene	3.4E+00	ca	7.9E+00	ca	3.1E-01	ca	5.0E-01	ca	2.0E+00	1.0E-01
4.5E-01	i			4.5E-01	r				0.1	91-94-1	3,3-Dichlorobenzidine	1.1E+00	ca	3.8E+00	ca	1.5E-02	ca	1.5E-01	ca	7.0E-03	3.0E-04
		3.0E-02	n			3.0E-02	r		0.1	90-98-2	4,4'-Dichlorobenzophenone	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
9.3E+00	r			9.3E+00	h			y		764-41-0	1,4-Dichloro-2-butene	7.9E-03	ca	1.8E-02	ca	7.2E-04	ca	1.2E-03	ca		
		2.0E-01	i			5.7E-02	h	y		75-71-8	Dichlorodifluoromethane	9.4E+01	nc	3.1E+02	nc	2.1E+02	nc	3.9E+02	nc		
		1.0E-01	h			1.4E-01	h	y		75-34-3	1,1-Dichloroethane	5.1E+02	nc	1.7E+03	nc	5.2E+02	nc	8.1E+02	nc	2.3E+01	1.0E+00
5.7E-03	c			5.7E-03	c			y			"CAL-Modified PRG"	2.8E+00	ca	6.0E+00	ca	1.2E+00	ca	2.0E+00	ca		
9.1E-02	i	2.0E-02	n	9.1E-02	i	1.4E-03	n	y		107-06-2	1,2-Dichloroethane (EDC)	2.8E-01	ca*	6.0E-01	ca*	7.4E-02	ca*	1.2E-01	ca*	2.0E-02	1.0E-03
		5.0E-02	i			5.7E-02	i	y		75-35-4	1,1-Dichloroethylene	1.2E+02	nc	4.1E+02	nc	2.1E+02	nc	3.4E+02	nc	6.0E-02	3.0E-03
		1.0E-02	p			1.0E-02	r	y		156-59-2	1,2-Dichloroethylene (cis)	4.3E+01	nc	1.5E+02	nc	3.7E+01	nc	6.1E+01	nc	4.0E-01	2.0E-02
		2.0E-02	i			2.0E-02	r	y		156-60-5	1,2-Dichloroethylene (trans)	6.9E+01	nc	2.3E+02	nc	7.3E+01	nc	1.2E+02	nc	7.0E-01	3.0E-02
		3.0E-03	i			3.0E-03	r		0.1	120-83-2	2,4-Dichlorophenol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc	1.0E+00	5.0E-02
		8.0E-03	i			8.0E-03	r		0.1	94-82-6	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		1.0E-02	i			1.0E-02	r		0.05	94-75-7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.9E+02	nc	7.7E+03	nc	3.7E+01	nc	3.6E+02	nc		
6.8E-02	h	1.1E-03	r	6.8E-02	r	1.1E-03	i	y		78-87-5	1,2-Dichloropropane	3.4E-01	ca*	7.4E-01	ca*	9.9E-02	ca*	1.6E-01	ca*	3.0E-02	1.0E-03
		2.0E-02	p			2.0E-02	r	y		142-28-9	**1,3-Dichloropropane**	1.0E+02	nc	3.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
1.0E-01	i	3.0E-02	i	1.4E-02	i	5.7E-03	i	y		542-75-6	1,3-Dichloropropene	7.8E-01	ca	1.8E+00	ca	4.8E-01	ca	4.0E-01	ca	4.0E-03	2.0E-04
		3.0E-03	i			3.0E-03	r		0.1	616-23-9	2,3-Dichloropropanol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
2.9E-01	i	5.0E-04	i	2.9E-01	r	1.4E-04	i		0.1	62-73-7	Dichlorvos	1.7E+00	ca*	5.9E+00	ca*	2.3E-02	ca*	2.3E-01	ca*		
4.4E-01	x			4.4E-01	r				0.1	115-32-2	Dicofol	1.1E+00	ca	3.9E+00	ca	1.5E-02	ca	1.5E-01	ca		
		3.0E-02	h			5.7E-05	x	y		77-73-6	Dicyclopentadiene	5.4E-01	nc	1.8E+00	nc	2.1E-01	nc	4.2E-01	nc		
1.6E+01	i	5.0E-05	i	1.6E+01	i	5.0E-05	r		0.1	60-57-1	Dieldrin	3.0E-02	ca	1.1E-01	ca	4.2E-04	ca	4.2E-03	ca	4.0E-03	2.0E-04
		1.0E-02	p			5.7E-03	p		0.1	112-34-5	Diethylene glycol, monobutyl ether	6.1E+02	nc	6.2E+03	nc	2.1E+01	nc	3.6E+02	nc		
		6.0E-02	p			8.6E-04	p		0.1	111-90-0	Diethylene glycol, monoethyl ether	3.7E+03	nc	3.7E+04	nc	3.1E+00	nc	2.2E+03	nc		
		4.0E-04	p			4.0E-04	r		0.1	617-84-5	Diethylformamide	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.2E-03	i	6.0E-01	i	1.2E-03	r	6.0E-01	r		0.1	103-23-1	Di(2-ethylhexyl)adipate	4.1E+02	ca	1.4E+03	ca	5.6E+00	ca	5.6E+01	ca		
		8.0E-01	i			8.0E-01	r		0.1	84-66-2	Diethyl phthalate	4.9E+04	nc	1.0E+05	max	2.9E+03	nc	2.9E+04	nc		
4.7E+03	h			4.7E+03	r				0.1	56-53-1	Diethylstilbestrol	1.0E-04	ca	3.7E-04	ca	1.4E-06	ca	1.4E-05	ca		
		8.0E-02	i			8.0E-02	r		0.1	43222-48-6	Difenzoquat (Avenge)	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	35367-38-5	Diflubenzuron	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.1E+01	r			1.1E+01	i	y		75-37-6	1,1-Difluoroethane					4.2E+04	nc	6.9E+04	nc		
		2.0E-02	n			2.0E-02	r		0.1	28553-12-0	Diisononyl phthalate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
						1.1E-01	p			108-20-3	**Diisopropyl ether**					4.0E+02	nc				
		8.0E-02	i			8.0E-02	r		0.1	1445-75-6	Diisopropyl methylphosphonate	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	55290-64-7	Dimethipin	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-04	i			2.0E-04	r		0.1	60-51-5	Dimethoate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
1.4E-02	h			1.4E-02	r				0.1	119-90-4	3,3'-Dimethoxybenzidine	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.7E-06	r			5.7E-06	x	y		124-40-3	Dimethylamine	6.7E-02	nc	2.5E-01	nc	2.1E-02	nc	3.5E-02	nc		
		2.0E-03	i			2.0E-03	r		0.1	121-69-7	N-N-Dimethylaniline	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
7.5E-01	h			7.5E-01	r				0.1	95-68-1	2,4-Dimethylaniline	6.5E-01	ca	2.3E+00	ca	9.0E-03	ca	9.0E-02	ca		

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ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES									CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C / skin abs. soils	CAS No.	Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
5.8E-01	h			5.8E-01	r			0.1	21436-96-4	2,4-Dimethylaniline hydrochloride	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
2.3E+00	p			2.3E+00	r			0.1	119-93-7	**3,3'-Dimethylbenzidine**	2.1E-01	ca	7.5E-01	ca	2.9E-03	ca	2.9E-02	ca		
		1.0E-01	h			8.6E-03	i	0.1	68-12-2	N,N-Dimethylformamide	6.1E+03	nc	6.2E+04	nc	3.1E+01	nc	3.6E+03	nc		
		1.0E-03	n			1.0E-03	r	0.1	122-09-8	Dimethylphenethylamine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.0E-02	i			2.0E-02	r	0.1	105-67-9	2,4-Dimethylphenol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc	9.0E+00	4.0E-01
		6.0E-04	i			6.0E-04	r	0.1	576-26-1	2,6-Dimethylphenol	3.7E+01	nc	3.7E+02	nc	2.2E+00	nc	2.2E+01	nc		
		1.0E-03	i			1.0E-03	r	0.1	95-65-8	3,4-Dimethylphenol	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E+01	h			1.0E+01	r	0.1	131-11-3	Dimethyl phthalate	1.0E+05	max	1.0E+05	max	3.7E+04	nc	3.6E+05	nc		
		1.0E-01	i			1.0E-01	r	0.1	120-61-6	Dimethyl terephthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		1.0E-04	p			1.0E-04	r	0.1	534-52-1	**4,6-Dinitro-o-cresol**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		2.0E-03	i			2.0E-03	r	0.1	131-89-5	4,6-Dinitro-o-cyclohexyl phenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.0E-04	p			1.0E-04	r	0.1	528-29-0	1,2-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.0E-04	i			1.0E-04	r	0.1	99-65-0	1,3-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.0E-04	p			1.0E-04	r	0.1	100-25-4	1,4-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		2.0E-03	i			2.0E-03	r	0.1	51-28-5	2,4-Dinitrophenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	3.0E-01	1.0E-02
6.8E-01	i			6.8E-01	r			0.1	25321-14-6	Dinitrotoluene mixture	7.2E-01	ca	2.5E+00	ca	9.9E-03	ca	9.9E-02	ca	8.0E-04	4.0E-05
		2.0E-03	i			2.0E-03	r	0.1	121-14-2	2,4-Dinitrotoluene (also see Dinitrotoluene mixture)	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	8.0E-04	4.0E-05
		1.0E-03	h			1.0E-03	r	0.1	606-20-2	2,6-Dinitrotoluene (also see Dinitrotoluene mixture)	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc	7.0E-04	3.0E-05
		1.0E-03	i			1.0E-03	r	0.1	88-85-7	Dinoseb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		4.0E-02	p			4.0E-02	r	0.1	117-84-0	di-n-Octyl phthalate	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc	1.0E+04	1.0E+04
1.1E-02	i			1.1E-02	r			0.1	123-91-1	1,4-Dioxane	4.4E+01	ca	1.6E+02	ca	6.1E-01	ca	6.1E+00	ca		
1.5E+05	h			1.5E+05	h			0.03	1746-01-6	Dioxin (2,3,7,8-TCDD)+++	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		3.0E-02	i			3.0E-02	r	0.1	957-51-7	Diphenamid	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r	0.1	122-39-4	Diphenylamine	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-04	p			3.0E-04	r	0.1	74-31-7	N,N-Diphenyl-1,4 benzenediamine (DPPD)	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
8.0E-01	i			8.0E-01	i			0.1	122-66-7	1,2-Diphenylhydrazine	6.1E-01	ca	2.2E+00	ca	8.4E-03	ca	8.4E-02	ca		
		3.0E-03	p			3.0E-03	r	0.1	127-63-9	Diphenyl sulfone	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.2E-03	i			2.2E-03	r	0.1	85-00-7	Diquat	1.3E+02	nc	1.4E+03	nc	8.0E+00	nc	8.0E+01	nc		
8.6E+00	h			8.6E+00	r			0.1	1937-37-7	Direct black 38	5.7E-02	ca	2.0E-01	ca	7.8E-04	ca	7.8E-03	ca		
8.1E+00	h			8.1E+00	r			0.1	2602-46-2	Direct blue 6	6.0E-02	ca	2.1E-01	ca	8.3E-04	ca	8.3E-03	ca		
9.3E+00	h			9.3E+00	r			0.1	16071-86-6	Direct brown 95	5.2E-02	ca	1.9E-01	ca	7.2E-04	ca	7.2E-03	ca		
		4.0E-05	i			4.0E-05	r	0.1	298-04-4	Disulfoton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc		
		1.0E-02	i			1.0E-02	r	0.1	505-29-3	1,4-Dithiane	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		2.0E-03	i			2.0E-03	r	0.1	330-54-1	Diuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		4.0E-03	i			4.0E-03	r	0.1	2439-10-3	Dodine	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		1.0E-01	n						7429-91-6	Dysprosium	7.8E+03	nc	1.0E+05	max			3.6E+03	nc		
		6.0E-03	i			6.0E-03	r	0.1	115-29-7	Endosulfan	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc	1.8E+01	9.0E-01
		2.0E-02	i			2.0E-02	r	0.1	145-73-3	Endothall	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	i			3.0E-04	r	0.1	72-20-8	Endrin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc	1.0E+00	5.0E-02
9.9E-03	i	2.0E-03	h	4.2E-03	h	2.9E-04	i	y	106-89-8	Epichlorohydrin	7.6E+00	nc	2.6E+01	nc	1.0E+00	nc	2.0E+00	nc		

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TOXICITY VALUES											CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.00E-02	r			8.00E-02	c			y			**"CAL-Modified PRG"**	1.3E+00	nc	2.9E+00	nc	8.4E-02	nc	1.4E-01	nc		
		5.7E-03	r			5.7E-03	i		0.1	106-88-7	1,2-Epoxybutane	3.5E+02	nc	3.5E+03	nc	2.1E+01	nc	2.1E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	759-94-4	EPTC (S-Ethyl dipropylthiocarbamate)	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	16672-87-0	Ethephon (2-chloroethyl phosphonic acid)	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-04	i			5.0E-04	r		0.1	563-12-2	Ethion	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		4.0E-01	h			5.7E-02	i		0.1	110-80-5	2-Ethoxyethanol	2.4E+04	nc	1.0E+05	max	2.1E+02	nc	1.5E+04	nc		
		3.0E-01	h			3.0E-01	r		0.1	111-15-9	2-Ethoxyethanol acetate	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		9.0E-01	i			9.0E-01	r	y		141-78-6	Ethyl acetate	1.9E+04	nc	3.7E+04	sat	3.3E+03	nc	5.5E+03	nc		
4.8E-02	h			4.8E-02	r			y		140-88-5	Ethyl acrylate	2.1E-01	ca	4.5E-01	ca	1.4E-01	ca	2.3E-01	ca		
		1.0E-01	i			2.9E-01	i	y		100-41-4	**Ethylbenzene**	4.0E+02	sat	4.0E+02	sat	1.1E+03	nc	1.3E+03	nc	1.3E+01	7.0E-01
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	i	y		75-00-3	Ethyl chloride	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		3.0E-01	h			3.0E-01	r		0.1	109-78-4	Ethylene cyanohydrin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		9.0E-02	p			9.0E-02	r		0.1	107-15-3	**Ethylene diamine**	5.5E+03	nc	5.5E+04	nc	3.3E+02	nc	3.3E+03	nc		
		2.0E+00	i			2.0E+00	r		0.1	107-21-1	Ethylene glycol	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
		5.0E-01	i			3.7E+00	i		0.1	111-76-2	Ethylene glycol, monobutyl ether	3.1E+04	nc	1.0E+05	max	1.4E+04	nc	1.8E+04	nc		
1.0E+00	h			3.5E-01	h			y		75-21-8	Ethylene oxide	1.4E-01	ca	3.4E-01	ca	1.9E-02	ca	2.4E-02	ca		
1.1E-01	h	8.0E-05	i	1.1E-01	r	8.0E-05	r		0.1	96-45-7	Ethylene thiourea (ETU)	4.4E+00	ca**	1.6E+01	ca**	6.1E-02	ca**	6.1E-01	ca**		
		2.0E-01	i			2.0E-01	r	y		60-29-7	Ethyl ether	1.8E+03	sat	1.8E+03	sat	7.3E+02	nc	1.2E+03	nc		
		9.0E-02	h			9.0E-02	r	y		97-63-2	Ethyl methacrylate	1.4E+02	sat	1.4E+02	sat	3.3E+02	nc	5.5E+02	nc		
		1.0E-05	i			1.0E-05	r		0.1	2104-64-5	Ethyl p-nitrophenyl phenylphosphorothioate	6.1E-01	nc	6.2E+00	nc	3.7E-02	nc	3.6E-01	nc		
		3.0E+00	i			3.0E+00	r		0.1	84-72-0	Ethylphthalyl ethyl glycolate	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		8.0E-03	i			8.0E-03	r		0.1	101200-48-0	Express	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		2.5E-04	i			2.5E-04	r		0.1	22224-92-6	Fenamiphos	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		1.3E-02	i			1.3E-02	r		0.1	2164-17-2	Fluometuron	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		6.0E-02	i						0.1	16984-48-8	Fluorine (soluble fluoride)	3.7E+03	nc	3.7E+04	nc			2.2E+03	nc		
		8.0E-02	i			8.0E-02	r		0.1	59756-60-4	Fluoridone	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	56425-91-3	Flurprimidol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-02	i			6.0E-02	r		0.1	66332-96-5	Flutolanil	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-02	i			1.0E-02	r		0.1	69409-94-5	Fluvalinate	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3.5E-03	i	1.0E-01	i	3.5E-03	r	1.0E-01	r		0.1	133-07-3	Folpet	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
1.9E-01	i			1.9E-01	r				0.1	72178-02-0	Fomesafen	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
		2.0E-03	i			2.0E-03	r		0.1	944-22-9	Fonofos	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.5E-01	i	4.6E-02	i				0.1	50-00-0	Formaldehyde	9.2E+03	nc	1.0E+05	nc	1.5E-01	ca	5.5E+03	nc		
		2.0E+00	h			8.6E-04	p		0.1	64-18-6	**Formic Acid**	1.0E+05	max	1.0E+05	max	3.1E+00	nc	7.3E+04	nc		
		3.0E+00	i			3.0E+00	r		0.1	39148-24-8	Fosetyl-al	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		3.0E+01	i			8.6E+00	h	y		76-13-1	Freon 113	5.6E+03	sat	5.6E+03	sat	3.1E+04	nc	5.9E+04	nc		
		1.0E-03	i			1.0E-03	r	y		110-00-9	Furan	2.5E+00	nc	8.5E+00	nc	3.7E+00	nc	6.1E+00	nc		
3.8E+00	h			3.8E+00	r				0.1	67-45-8	Furazolidone	1.3E-01	ca	4.5E-01	ca	1.8E-03	ca	1.8E-02	ca		
		3.0E-03	i			1.4E-02	h		0.1	98-01-1	Furfural	1.8E+02	nc	1.8E+03	nc	5.2E+01	nc	1.1E+02	nc		
5.0E+01	h			5.0E+01	r				0.1	531-82-8	Furium	9.7E-03	ca	3.4E-02	ca	1.3E-04	ca	1.3E-03	ca		
3.0E-02	i			3.0E-02	r				0.1	60568-05-0	Furmecyclox	1.6E+01	ca	5.7E+01	ca	2.2E-01	ca	2.2E+00	ca		
		4.0E-04	i			4.0E-04	r		0.1	77182-82-2	Glufosinate-ammonium	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG)
ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES											CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		4.0E-04	i			2.9E-04	h		0.1	765-34-4	Glycidaldehyde	2.4E+01	nc	2.5E+02	nc	1.0E+00	nc	1.5E+01	nc		
		1.0E-01	i			1.0E-01	r		0.1	1071-83-6	Glyphosate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-05	i			5.0E-05	r		0.1	69806-40-2	Haloxyfop-methyl	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		1.3E-02	i			1.3E-02	r		0.1	79277-27-3	Harmony	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
4.5E+00	i	5.0E-04	i	4.6E+00	i	5.0E-04	r		0.1	76-44-8	Heptachlor	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca	2.3E+01	1.0E+00
9.1E+00	i	1.3E-05	i	9.1E+00	i	1.3E-05	r		0.1	1024-57-3	Heptachlor epoxide	5.3E-02	ca*	1.9E-01	ca*	7.4E-04	ca*	7.4E-03	ca*	7.0E-01	3.0E-02
		2.0E-03	i			2.0E-03	r		0.1	87-82-1	Hexabromobenzene	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
1.6E+00	i	8.0E-04	i	1.6E+00	i	8.0E-04	r		0.1	118-74-1	Hexachlorobenzene	3.0E-01	ca	1.1E+00	ca	4.2E-03	ca	4.2E-02	ca	2.0E+00	1.0E-01
7.8E-02	i	3.0E-04	n	7.8E-02	i	3.0E-04	r		0.1	87-68-3	Hexachlorobutadiene	6.2E+00	ca**	2.2E+01	ca**	8.6E-02	ca*	8.6E-01	ca*	2.0E+00	1.0E-01
6.3E+00	i	5.0E-04	n	6.3E+00	i	5.0E-04	r		0.04	319-84-6	HCH (alpha)	9.0E-02	ca	3.6E-01	ca	1.1E-03	ca	1.1E-02	ca	5.0E-04	3.0E-05
1.8E+00	i	2.0E-04	n	1.8E+00	i	2.0E-04	r		0.04	319-85-7	HCH (beta)	3.2E-01	ca	1.3E+00	ca	3.7E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
1.3E+00	h	3.0E-04	i	1.3E+00	r	3.0E-04	r		0.04	58-89-9	HCH (gamma) Lindane	4.4E-01	ca*	1.7E+00	ca	5.2E-03	ca	5.2E-02	ca	9.0E-03	5.0E-04
1.8E+00	i			1.8E+00	i				0.04	608-73-1	HCH-technical	3.2E-01	ca	1.3E+00	ca	3.8E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
		6.0E-03	i			5.7E-05	i		0.1	77-47-4	Hexachlorocyclopentadiene	3.7E+02	nc	3.7E+03	nc	2.1E-01	nc	2.2E+02	nc	4.0E+02	2.0E+01
1.4E-02	i	1.0E-03	i	1.4E-02	i	1.0E-03	r		0.1	67-72-1	Hexachloroethane	3.5E+01	ca**	1.2E+02	ca**	4.8E-01	ca**	4.8E+00	ca**	5.0E-01	2.0E-02
		3.0E-04	i			3.0E-04	r		0.1	70-30-4	Hexachlorophene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r		0.1	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		2.9E-06	r			2.9E-06	i		0.1	822-06-0	1,6-Hexamethylene diisocyanate	1.7E-01	nc	1.8E+00	nc	1.0E-02	nc	1.0E-01	nc		
		1.1E+01	p			5.7E-02	i	y		110-54-3	**n-Hexane**	1.1E+02	sat	1.1E+02	sat	2.1E+02	nc	4.2E+02	nc		
		3.3E-02	i			3.3E-02	r		0.1	51235-04-2	Hexazinone	2.0E+03	nc	2.0E+04	nc	1.2E+02	nc	1.2E+03	nc		
		5.0E-02	i			5.0E-02	r		0.1	2691-41-0	HMX	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
3.0E+00	i			1.7E+01	i				0.1	302-01-2	Hydrazine, hydrazine sulfate	1.6E-01	ca	5.7E-01	ca	3.9E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.1	60-34-4	Hydrazine, monomethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.1	57-14-7	Hydrazine, dimethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
						5.7E-03	i			7647-01-0	Hydrogen chloride					2.1E+01	nc				
		2.0E-02	i			8.6E-04	i	y		74-90-8	Hydrogen cyanide	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		
		3.0E-03	i			2.9E-04	i			7783-06-4	Hydrogen sulfide					1.0E+00	nc	1.1E+02	nc		
5.6E-02	p	4.0E-02	p	5.6E-02	r	4.0E-02	r		0.1	123-31-9	**p-Hydroquinone**	8.7E+00	ca	3.1E+01	ca	1.2E-01	ca	1.2E+00	ca		
		1.3E-02	i			1.3E-02	r		0.1	35554-44-0	Imazalil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-01	i			2.5E-01	r		0.1	81335-37-7	Imazaquin	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		4.0E-02	i			4.0E-02	r		0.1	36734-19-7	Iprodione	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		3.0E-01	n							7439-89-6	Iron	2.3E+04	nc	1.0E+05	max			1.1E+04	nc		
		3.0E-01	i			3.0E-01	r	y		78-83-1	Isobutanol	1.3E+04	nc	4.0E+04	sat	1.1E+03	nc	1.8E+03	nc		
9.5E-04	i	2.0E-01	i	9.5E-04	r	2.0E-01	r		0.1	78-59-1	Isophorone	5.1E+02	ca*	5.1E+02	ca*	7.1E+00	ca	7.1E+01	ca	5.0E-01	3.0E-02
		1.5E-02	i			1.5E-02	r		0.1	33820-53-0	Isopropalin	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		1.0E-01	i			1.1E-01	r		0.1	1832-54-8	Isopropyl methyl phosphonic acid	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
		5.0E-02	i			5.0E-02	r		0.1	82558-50-7	Isoxaben	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
8.0E+00	p	2.0E-04	p	8.0E+00	r	2.0E-04	r		0.1	143-50-0	Kepone	6.1E-02	ca	2.2E-01	ca	8.4E-04	ca	8.4E-03	ca		
		2.0E-03	i			2.0E-03	r		0.1	77501-63-4	Lactofen	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
www.epa.gov/superfund/programs/lead/ieubk.htm										7439-92-1	**Lead+++**	4.0E+02	nc	8.0E+02	nc						
www.dtsc.ca.gov/ScienceTechnology/ledspred.html											"CAL-Modified PRG"+++	1.5E+02	nc								
		1.0E-07	i						0.1	78-00-2	Lead (tetraethyl)	6.1E-03	nc	6.2E-02	nc			3.6E-03	nc		

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TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		2.0E-03	i			2.0E-03	r		0.1	330-55-2	Linuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	x							7439-93-2	Lithium	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc		
		2.0E-01	i			2.0E-01	r		0.1	83055-99-6	Londax	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	121-75-5	Malathion	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			1.0E-01	r		0.1	108-31-6	Maleic anhydride	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-01	i			5.0E-01	r	y		123-33-1	Maleic hydrazide	1.7E+03	nc	2.4E+03	sat	1.8E+03	nc	3.0E+03	nc		
		1.0E-04	p			1.0E-04	r		0.1	109-77-3	**Malononitrile**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		3.0E-02	h			3.0E-02	r		0.1	8018-01-7	Mancozeb	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
6.0E-02	o	5.0E-03	i	6.0E-02	r	5.0E-03	r		0.1	12427-38-2	Maneb	8.1E+00	ca*	2.9E+01	ca	1.1E-01	ca	1.1E+00	ca		
		2.4E-02	i			1.4E-05	i			7439-96-5	Manganese and compounds+++	1.8E+03	nc	1.9E+04	nc	5.1E-02	nc	8.8E+02	nc		
		9.0E-05	h			9.0E-05	r		0.1	950-10-7	Mephosfolan	5.5E+00	nc	5.5E+01	nc	3.3E-01	nc	3.3E+00	nc		
		3.0E-02	i			3.0E-02	r		0.1	24307-26-4	Mepiquat chloride	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
2.9E-02	n	1.0E-01	n	2.9E-02	r	1.0E-01	r		0.1	149-30-4	2-Mercaptobenzothiazole	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		3.0E-04	i							7487-94-7	Mercury and compounds	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
						8.6E-05	i			7439-97-6	Mercury (elemental)					3.1E-01	nc				
		1.0E-04	i						0.1	22967-92-6	Mercury (methyl)	6.1E+00	nc	6.2E+01	nc			3.6E+00	nc		
		3.0E-05	i			3.0E-05	r		0.1	150-50-5	Merphos	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		3.0E-05	i			3.0E-05	r		0.1	78-48-8	Merphos oxide	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		6.0E-02	i			6.0E-02	r		0.1	57837-19-1	Metalaxyl	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-04	i			2.0E-04	h	y		126-98-7	Methacrylonitrile	2.1E+00	nc	8.4E+00	nc	7.3E-01	nc	1.0E+00	nc		
		5.0E-05	i			5.0E-05	r		0.1	10265-92-6	Methamidophos	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		5.0E-01	i			5.0E-01	r		0.1	67-56-1	Methanol	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
		1.0E-03	i			1.0E-03	r		0.1	950-37-8	Methidathion	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r	y		16752-77-5	Methomyl	4.4E+01	nc	1.5E+02	nc	9.1E+01	nc	1.5E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	72-43-5	Methoxychlor	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc	1.6E+02	8.0E+00
		1.0E-03	h			5.7E-03	i		0.1	109-86-4	2-Methoxyethanol	6.1E+01	nc	6.2E+02	nc	2.1E+01	nc	3.6E+01	nc		
		2.0E-03	h			2.0E-03	r		0.1	110-49-6	2-Methoxyethanol acetate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
4.6E-02	h			4.6E-02	r				0.1	99-59-2	2-Methoxy-5-nitroaniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E+00	h			1.0E+00	r	y		79-20-9	Methyl acetate	2.2E+04	nc	9.2E+04	nc	3.7E+03	nc	6.1E+03	nc		
		3.0E-02	h			3.0E-02	r	y		96-33-3	Methyl acrylate	7.0E+01	nc	2.3E+02	nc	1.1E+02	nc	1.8E+02	nc		
2.4E-01	h			2.4E-01	r				0.1	95-53-4	2-Methylaniline (o-toluidine)	2.0E+00	ca	7.2E+00	ca	2.8E-02	ca	2.8E-01	ca		
1.8E-01	h			1.8E-01	r				0.1	636-21-5	2-Methylaniline hydrochloride	2.7E+00	ca	9.6E+00	ca	3.7E-02	ca	3.7E-01	ca		
		5.0E-04	i			5.0E-04	r		0.1	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		1.0E-02	i			1.0E-02	r		0.1	94-81-5	4-(2-Methyl-4-chlorophenoxy) butyric acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-03	i			1.0E-03	r		0.1	93-65-2	2-(2-Methyl-4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	i			1.0E-03	r		0.1	16484-77-8	2-(2-Methyl-1,4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		8.6E-01	r			8.6E-01	h	y		108-87-2	Methylcyclohexane	2.6E+03	nc	8.7E+03	nc	3.1E+03	nc	5.2E+03	nc		
2.5E-01	h			2.5E-01	r				0.1	101-77-9	4,4'-Methylenebisbenzeneamine	1.9E+00	ca	6.9E+00	ca	2.7E-02	ca	2.7E-01	ca		
1.3E-01	h	7.0E-04	h	1.3E-01	h	7.0E-04	r		0.1	101-14-4	4,4'-Methylene bis(2-chloroaniline)	3.7E+00	ca*	1.3E+01	ca*	5.2E-02	ca*	5.2E-01	ca*		
4.6E-02	i			4.6E-02	r				0.1	101-61-1	4,4'-Methylene bis(N,N'-dimethyl)aniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E-02	h			1.0E-02	r	y		74-95-3	Methylene bromide	6.7E+01	nc	2.3E+02	nc	3.7E+01	nc	6.1E+01	nc		
7.5E-03	i	6.0E-02	i	1.6E-03	i	8.6E-01	h	y		75-09-2	Methylene chloride	9.1E+00	ca	2.1E+01	ca	4.1E+00	ca	4.3E+00	ca	2.0E-02	1.0E-03

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ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES											CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.7E-04	r			1.7E-04	i		0.1	101-68-8	4,4'-Methylene diphenyl diisocyanate	1.0E+01	nc	1.0E+02	nc	6.2E-01	nc	6.2E+00	nc		
		6.0E-01	i			1.4E+00	i	y		78-93-3	**Methyl ethyl ketone (2-Butanone)**	2.2E+04	nc	1.1E+05	nc	5.1E+03	nc	7.0E+03	nc		
		8.0E-02	h			8.6E-01	i	y		108-10-1	**Methyl isobutyl ketone**	5.3E+03	nc	4.7E+04	nc	3.1E+03	nc	2.0E+03	nc		
		5.7E-04	r			5.7E-04	n		0.1	74-93-1	Methyl Mercaptan	3.5E+01	nc	3.5E+02	nc	2.1E+00	nc	2.1E+01	nc		
		1.4E+00	i			2.0E-01	i	y		80-62-6	Methyl methacrylate	2.2E+03	nc	2.7E+03	sat	7.3E+02	nc	1.4E+03	nc		
3.3E-02	h			3.3E-02	r				0.1	99-55-8	2-Methyl-5-nitroaniline	1.5E+01	ca	5.2E+01	ca	2.0E-01	ca	2.0E+00	ca		
		2.5E-04	i			2.5E-04	r		0.1	298-00-0	Methyl parathion	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		5.0E-02	i			5.0E-02	r		0.1	95-48-7	2-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc	1.5E+01	8.0E-01
		5.0E-02	i			5.0E-02	r		0.1	108-39-4	3-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	h			5.0E-03	r		0.1	106-44-5	4-Methylphenol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	p			2.0E-02	r		0.1	993-13-5	Methyl phosphonic acid	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-03	h			1.1E-02	h	y		25013-15-4	Methyl styrene (mixture)	1.3E+02	nc	5.4E+02	nc	4.2E+01	nc	6.0E+01	nc		
		7.0E-02	h			7.0E-02	r	y		98-83-9	Methyl styrene (alpha)	6.8E+02	sat	6.8E+02	sat	2.6E+02	nc	4.3E+02	nc		
1.8E-03	c	8.6E-01	r	9.1E-04	c	8.6E-01	i	y		1634-04-4	**Methyl tertbutyl ether (MTBE)**	3.2E+01	ca	7.0E+01	ca	7.4E+00	ca	1.1E+01	ca		
		1.5E-01	i			1.5E-01	r		0.1	51218-45-2	Metolaclor (Dual)	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		2.5E-02	i			2.5E-02	r		0.1	21087-64-9	Metribuzin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.8E+00	x	2.0E-04	i	1.8E+00	r	2.0E-04	r		0.1	2385-85-5	Mirex	2.7E-01	ca*	9.6E-01	ca	3.7E-03	ca	3.7E-02	ca		
		2.0E-03	i			2.0E-03	r		0.1	2212-67-1	Molinate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-03	i							7439-98-7	Molybdenum	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc		
		1.0E-01	i			1.0E-01	r		0.1	10599-90-3	Monochloramine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-03	i			2.0E-03	r		0.1	300-76-5	Naled	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.0E-01	i			1.0E-01	r		0.1	15299-99-7	Napropamide	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-02	i							7440-02-0	Nickel (soluble salts)	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc	1.3E+02	7.0E+00
				8.4E-01	i						Nickel refinery dust					8.0E-03	ca				
				1.7E+00	i					12035-72-2	Nickel subsulfide			1.1E+04	ca	4.0E-03	ca				
Tap Water PRG Based on Infant NOAEL (see IRIS)										14797-55-8	Nitrate+++							1.0E+04	nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)										14797-65-0	Nitrite+++							1.0E+03	nc		
		3.0E-03	p			3.0E-05	p		0.1	88-74-4	**2-Nitroaniline**	1.8E+02	nc	1.8E+03	nc	1.1E-01	nc	1.1E+02	nc		
2.1E-02	p	3.0E-04	p	2.1E-02	r	3.0E-04	p		0.1	99-09-2	**3-Nitroaniline**	1.8E+01	nc	8.2E+01	ca**	3.2E-01	ca**	3.2E+00	ca**		
2.1E-02	p	3.0E-03	p	2.1E-02	r	1.0E-03	p		0.1	100-01-6	**4-Nitroaniline**	2.3E+01	ca**	8.2E+01	ca*	3.2E-01	ca*	3.2E+00	ca*		
		5.0E-04	i			5.7E-04	h	y		98-95-3	Nitrobenzene	2.0E+01	nc	1.0E+02	nc	2.1E+00	nc	3.4E+00	nc	1.0E-01	7.0E-03
		7.0E-02	h			7.0E-02	r		0.1	67-20-9	Nitrofurantoin	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
1.5E+00	h			1.5E+00	r				0.1	59-87-0	Nitrofurazone	3.2E-01	ca	1.1E+00	ca	4.5E-03	ca	4.5E-02	ca		
1.4E-02	n			1.4E-02	r				0.1	55-63-0	Nitroglycerin	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		1.0E-01	i			1.0E-01	r		0.1	556-88-7	Nitroguanidine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
9.4E+00	r	5.7E-03	r	9.4E+00	h	5.7E-03	i	y		79-46-9	2-Nitropropane					7.2E-04	ca	1.2E-03	ca		
5.4E+00	i			5.6E+00	i			y		924-16-3	N-Nitrosodi-n-butylamine	2.4E-02	ca	5.8E-02	ca	1.2E-03	ca	2.0E-03	ca		
2.8E+00	i			2.8E+00	r				0.1	1116-54-7	N-Nitrosodiethanolamine	1.7E-01	ca	6.2E-01	ca	2.4E-03	ca	2.4E-02	ca		
1.5E+02	i			1.5E+02	i				0.1	55-18-5	N-Nitrosodiethylamine	3.2E-03	ca	1.1E-02	ca	4.5E-05	ca	4.5E-04	ca		
5.1E+01	i	8.0E-06	p	4.9E+01	i	8.0E-06	r		0.1	62-75-9	**N-Nitrosodimethylamine**	9.5E-03	ca*	3.4E-02	ca	1.4E-04	ca	1.3E-03	ca		
4.9E-03	i	2.0E-02	p	4.9E-03	r	2.0E-02	r		0.1	86-30-6	**N-Nitrosodiphenylamine**	9.9E+01	ca*	3.5E+02	ca*	1.4E+00	ca*	1.4E+01	ca*	1.0E+00	6.0E-02
7.0E+00	i			7.0E+00	r				0.1	621-64-7	N-Nitroso di-n-propylamine	6.9E-02	ca	2.5E-01	ca	9.6E-04	ca	9.6E-03	ca	5.0E-05	2.0E-06

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ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
2.2E+01	i			2.2E+01	r				0.1	10595-95-6	N-Nitroso-N-methylethylamine	2.2E-02	ca	7.8E-02	ca	3.1E-04	ca	3.1E-03	ca		
2.1E+00	i			2.1E+00	i				0.1	930-55-2	N-Nitrosopyrrolidine	2.3E-01	ca	8.2E-01	ca	3.1E-03	ca	3.2E-02	ca		
		2.0E-02	p			2.0E-02	r	y		99-08-1	**m-Nitrotoluene**	7.3E+02	nc	1.0E+03	sat	7.3E+01	nc	1.2E+02	nc		
2.3E-01	p	1.0E-02	h	2.3E-01	r	1.0E-02	r	y		88-72-2	**o-Nitrotoluene**	8.8E-01	ca	2.2E+00	ca	2.9E-02	ca	4.9E-02	ca		
1.7E-02	p	1.0E-02	p	1.7E-02	r	1.0E-02	r	y		99-99-0	**p-Nitrotoluene**	1.2E+01	ca*	3.0E+01	ca*	4.0E-01	ca*	6.6E-01	ca*		
		4.0E-02	i			4.0E-02	r		0.1	27314-13-2	Norflurazon	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		7.0E-04	i			7.0E-04	r		0.1	85509-19-9	NuStar	4.3E+01	nc	4.3E+02	nc	2.6E+00	nc	2.6E+01	nc		
		3.0E-03	i			3.0E-03	r		0.1	32536-52-0	Octabromodiphenyl ether	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.0E-03	h			2.0E-03	r		0.1	152-16-9	Octamethylpyrophosphoramide	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-02	i			5.0E-02	r		0.1	19044-88-3	Oryzalin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	19666-30-9	Oxadiazon	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	23135-22-0	Oxamyl	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-03	i			3.0E-03	r		0.1	42874-03-3	Oxyfluorfen	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	76738-62-0	Paclobutrazol	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		4.5E-03	i			4.5E-03	r		0.1	4685-14-7	Paraquat	2.7E+02	nc	2.8E+03	nc	1.6E+01	nc	1.6E+02	nc		
		6.0E-03	h			6.0E-03	r		0.1	56-38-2	Parathion	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		5.0E-02	h			5.0E-02	r		0.1	1114-71-2	Pebulate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-02	i			4.0E-02	r		0.1	40487-42-1	Pendimethalin	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
2.3E-02	h			2.3E-02	r				0.1	87-84-3	Pentabromo-6-chloro cyclohexane	2.1E+01	ca	7.5E+01	ca	2.9E-01	ca	2.9E+00	ca		
		2.0E-03	i			2.0E-03	r		0.1	32534-81-9	Pentabromodiphenyl ether	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.0E-04	i			8.0E-04	r		0.1	608-93-5	Pentachlorobenzene	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
2.6E-01	h	3.0E-03	i	2.6E-01	r	3.0E-03	r		0.1	82-68-8	Pentachloronitrobenzene	1.9E+00	ca*	6.6E+00	ca	2.6E-02	ca	2.6E-01	ca		
1.2E-01	i	3.0E-02	i	1.2E-01	r	3.0E-02	r		0.25	87-86-5	Pentachlorophenol	3.0E+00	ca	9.0E+00	ca	5.6E-02	ca	5.6E-01	ca	3.0E-02	1.0E-03
		1.0E-04	n							7601-90-3	Perchlorate	7.8E+00	ca/nc	1.0E+02	ca/nc			3.6E+00	ca/nc		
		5.0E-02	i			5.0E-02	r		0.1	52645-53-1	Permethrin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.5E-01	i			2.5E-01	r		0.1	13684-63-4	Phenmedipham	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		3.0E-01	i			3.0E-01	r		0.1	108-95-2	**Phenol**	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc	1.0E+02	5.0E+00
		2.0E-03	n			2.0E-03	r		0.1	92-84-2	Phenothiazine	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		6.0E-03	i			6.0E-03	r		0.1	108-45-2	m-Phenylenediamine	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
4.7E-02	h			4.7E-02	r				0.1	95-54-5	**o-Phenylenediamine**	1.0E+01	ca	3.7E+01	ca	1.4E-01	ca	1.4E+00	ca		
		1.9E-01	h			1.9E-01	r		0.1	106-50-3	p-Phenylenediamine	1.2E+04	nc	1.0E+05	max	6.9E+02	nc	6.9E+03	nc		
		8.0E-05	i			8.0E-05	r		0.1	62-38-4	Phenylmercuric acetate	4.9E+00	nc	4.9E+01	nc	2.9E-01	nc	2.9E+00	nc		
1.9E-03	h			1.9E-03	r				0.1	90-43-7	2-Phenylphenol	2.5E+02	ca	8.9E+02	ca	3.5E+00	ca	3.5E+01	ca		
		2.0E-04	h			2.0E-04	r		0.1	298-02-2	Phorate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
		2.0E-02	i			2.0E-02	r		0.1	732-11-6	Phosmet	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	i			8.6E-05	i		0.1	7803-51-2	Phosphine	1.8E+01	nc	1.8E+02	nc	3.1E-01	nc	1.1E+01	nc		
						2.9E-03	i			7664-38-2	Phosphoric acid					1.0E+01	nc				
		2.0E-05	i							7723-14-0	Phosphorus (white)	1.6E+00	nc	2.0E+01	nc			7.3E-01	nc		
		1.0E+00	h			1.0E+00	r		0.1	100-21-0	p-Phthalic acid	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
		2.0E+00	i			3.4E-02	h		0.1	85-44-9	Phthalic anhydride	1.0E+05	max	1.0E+05	max	1.2E+02	nc	7.3E+04	nc		
		7.0E-02	i			7.0E-02	r		0.1	1918-02-1	Picloram	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		1.0E-02	i			1.0E-02	r		0.1	29232-93-7	Pirimiphos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG)
ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES											CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.9E+00	h	7.0E-06	h	8.9E+00	r	7.0E-06	r		0.1		Polybrominated biphenyls	5.5E-02	ca**	1.9E-01	ca*	7.6E-04	ca*	7.6E-03	ca*		
											Polychlorinated biphenyls (PCBs, see IRIS)										
7.0E-02	i	7.0E-05	i	7.0E-02	i	7.0E-05	r		0.14	12674-11-2	PCBs (unspeciated mixture, low risk, e.g. Aroclor 1016)	3.9E+00	nc	2.1E+01	ca**	9.6E-02	ca**	9.6E-01	ca**		
2.0E+00	i	2.0E-05	i	2.0E+00	i	2.0E-05	r		0.14	11097-69-1	PCBs (unspeciated mixture, high risk, e.g. Aroclor 1254)	2.2E-01	ca**	7.4E-01	ca*	3.4E-03	ca*	3.4E-02	ca*		
4.5E+00	n			4.5E+00	r				0.1	61788-33-8	Polychlorinated terphenyls	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
											Polynuclear aromatic hydrocarbons (PAHs)										
		6.0E-02	i			6.0E-02	r	y		83-32-9	Acenaphthene	3.7E+03	nc	2.9E+04	nc	2.2E+02	nc	3.7E+02	nc	5.7E+02	2.9E+01
		3.0E-01	i			3.0E-01	r	y		120-12-7	Anthracene	2.2E+04	nc	1.0E+05	max	1.1E+03	nc	1.8E+03	nc	1.2E+04	5.9E+02
7.3E-01	n			7.3E-01	r				0.13	56-55-3	Benz[a]anthracene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	2.0E+00	8.0E-02
7.3E-01	n			7.3E-01	r				0.13	205-99-2	Benzo[b]fluoranthene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	5.0E+00	2.0E-01
7.3E-02	n			7.3E-02	r				0.13	207-08-9	Benzo[k]fluoranthene	6.2E+00	ca	2.1E+01	ca	9.2E-02	ca	9.2E-01	ca	4.9E+01	2.0E+00
1.2E+00	c			3.9E-01	c				0.13	207-08-9	"CAL-Modified PRG"	3.8E-01	ca	1.3E+00	ca	1.7E-02	ca	5.6E-02	ca		
7.3E+00	i			7.3E+00	r				0.13	50-32-8	Benzo[a]pyrene	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	8.0E+00	4.0E-01
7.3E-03	n			7.3E-03	r				0.13	218-01-9	Chrysene	6.2E+01	ca	2.1E+02	ca	9.2E-01	ca	9.2E+00	ca	1.6E+02	8.0E+00
1.2E-01	c			3.9E-02	c				0.13		"CAL-Modified PRG"	3.8E+00	ca	1.3E+01	ca	1.7E-01	ca	5.6E-01	ca		
7.3E+00	n			7.3E+00	r				0.13	53-70-3	Dibenz[ah]anthracene	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	2.0E+00	8.0E-02
		4.0E-02	i			4.0E-02	r		0.13	206-44-0	Fluoranthene	2.3E+03	nc	2.2E+04	nc	1.5E+02	nc	1.5E+03	nc	4.3E+03	2.1E+02
		4.0E-02	i			4.0E-02	r	y		86-73-7	Fluorene	2.7E+03	nc	2.6E+04	nc	1.5E+02	nc	2.4E+02	nc	5.6E+02	2.8E+01
7.3E-01	n			7.3E-01	r				0.13	193-39-5	Indeno[1,2,3-cd]pyrene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	1.4E+01	7.0E-01
		2.0E-02	i			8.6E-04	i	y		91-20-3	Naphthalene	5.6E+01	nc	1.9E+02	nc	3.1E+00	nc	6.2E+00	nc	8.4E+01	4.0E+00
1.2E-01	r			1.2E-01	c						**"CAL-Modified PRG"**	1.7E+00	ca	4.2E+00	ca	5.6E-02	ca	9.3E-02	ca		
		3.0E-02	i			3.0E-02	r	y		129-00-0	Pyrene	2.3E+03	nc	2.9E+04	nc	1.1E+02	nc	1.8E+02	nc	4.2E+03	2.1E+02
1.5E-01	i	9.0E-03	i	1.5E-01	r	9.0E-03	r		0.1	67747-09-5	Prochloraz	3.2E+00	ca	1.1E+01	ca	4.5E-02	ca	4.5E-01	ca		
		6.0E-03	h			6.0E-03	r		0.1	26399-36-0	Profluralin	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		1.5E-02	i			1.5E-02	r		0.1	1610-18-0	Prometon	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		4.0E-03	i			4.0E-03	r		0.1	7287-19-6	Prometryn	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		7.5E-02	i			7.5E-02	r		0.1	23950-58-5	Pronamide	4.6E+03	nc	4.6E+04	nc	2.7E+02	nc	2.7E+03	nc		
		1.3E-02	i			1.3E-02	r		0.1	1918-16-7	Propachlor	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	709-98-8	Propanil	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r		0.1	2312-35-8	Propargite	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-03	i			2.0E-03	r		0.1	107-19-7	Propargyl alcohol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	i			2.0E-02	r		0.1	139-40-2	Propazine	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r		0.1	122-42-9	Propham	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	60207-90-1	Propiconazole	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
										98-82-8	Isopropylbenzene (see Cumene)										
		4.0E-02	n			4.0E-02	r	y		103-65-1	n-Propylbenzene	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		5.0E-01	p			8.6E-04	p		0.1	57-55-6	Propylene glycol	3.0E+04	nc	1.0E+05	max	3.1E+00	nc	1.8E+04	nc		
		7.0E-01	h			7.0E-01	r		0.1	52125-53-8	Propylene glycol, monoethyl ether	4.3E+04	nc	1.0E+05	max	2.6E+03	nc	2.6E+04	nc		
		7.0E-01	h			5.7E-01	i		0.1	107-98-2	Propylene glycol, monomethyl ether	4.3E+04	nc	1.0E+05	max	2.1E+03	nc	2.6E+04	nc		
2.4E-01	i	8.6E-03	r	1.3E-02	i	8.6E-03	i	y		75-56-9	Propylene oxide	1.9E+00	ca*	6.6E+00	ca*	5.2E-01	ca*	2.2E-01	ca		
		2.5E-01	i			2.5E-01	r		0.1	81335-77-5	Pursuit	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		2.5E-02	i			2.5E-02	r		0.1	51630-58-1	Pydrin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		

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TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.0E-03	i			1.0E-03	r		0.1	110-86-1	Pyridine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		5.0E-04	i			5.0E-04	r		0.1	13593-03-8	Quinalphos	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
3.0E+00	i			3.0E+00	r				0.1	91-22-5	Quinoline	1.6E-01	ca	5.7E-01	ca	2.2E-03	ca	2.2E-02	ca		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r		0.1	121-82-4	RDX (Cyclonite)	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		3.0E-02	i			3.0E-02	r		0.1	10453-86-8	Resmethrin	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		5.0E-02	h			5.0E-02	r		0.1	299-84-3	Ronnel	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-03	i			4.0E-03	r		0.1	83-79-4	Rotenone	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	78587-05-0	Savey	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		5.0E-03	i						0.1	7783-00-8	Selenious Acid	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		5.0E-03	i							7782-49-2	Selenium	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	5.0E+00	3.0E-01
		5.0E-03	h						0.1	630-10-4	Selenourea	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		9.0E-02	i			9.0E-02	r		0.1	74051-80-2	Sethoxydim	5.5E+03	nc	5.5E+04	nc	3.3E+02	nc	3.3E+03	nc		
		5.0E-03	i							7440-22-4	Silver and compounds	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	3.4E+01	2.0E+00
1.2E-01	h	5.0E-03	i	1.2E-01	r	5.00E-03	r		0.1	122-34-9	Simazine	4.1E+00	ca*	1.4E+01	ca	5.6E-02	ca	5.6E-01	ca		
		4.0E-03	i							26628-22-8	Sodium azide										
2.7E-01	h	3.0E-02	i	2.7E-01	r	3.0E-02	r		0.1	148-18-5	Sodium diethyldithiocarbamate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-05	i			2.0E-05	r		0.1	62-74-8	Sodium fluoroacetate	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		1.0E-03	h			1.0E-03	r		0.1	13718-26-8	Sodium metavanadate	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		6.0E-01	i							7440-24-6	Strontium, stable	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		3.0E-04	i			3.0E-04	r		0.1	57-24-9	Strychnine	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		2.0E-01	i			2.9E-01	i	y		100-42-5	Styrene	1.7E+03	sat	1.7E+03	sat	1.1E+03	nc	1.6E+03	nc	4.0E+00	2.0E-01
		5.0E-03	p			5.0E-03	r			80-07-9	**1,1'-Sulfonylbis (4-chlorobenzene)**	3.9E+02	nc	5.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	88671-89-0	Systhane	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.5E+05	h			1.5E+05	h				0.03	1746-01-6	2,3,7,8-TCDD (dioxin)	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		7.0E-02	i			7.0E-02	r		0.1	34014-18-1	Tebuthiuron	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-02	h			2.0E-02	r		0.1	3383-96-8	Temephos	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	5902-51-2	Terbacil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-05	h			2.5E-05	r		0.1	13071-79-9	Terbufos	1.5E+00	nc	1.5E+01	nc	9.1E-02	nc	9.1E-01	nc		
		1.0E-03	i			1.0E-03	r		0.1	886-50-0	Terbutryn	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		3.0E-04	i			3.0E-04	r		0.1	95-94-3	1,2,4,5-Tetrachlorobenzene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
2.6E-02	i	3.0E-02	i	2.6E-02	i	3.0E-02	r	y		630-20-6	1,1,1,2-Tetrachloroethane	3.2E+00	ca	7.3E+00	ca	2.6E-01	ca	4.3E-01	ca		
2.0E-01	i	6.0E-02	p	2.0E-01	i	6.0E-02	r	y		79-34-5	1,1,2,2-Tetrachloroethane	4.1E-01	ca	9.3E-01	ca	3.3E-02	ca	5.5E-02	ca	3.0E-03	2.0E-04
5.4E-01	c	1.0E-02	i	2.1E-02	c	1.0E-02	c	y		127-18-4	**Tetrachloroethylene (PCE)**	4.8E-01	ca*	1.3E+00	ca	3.2E-01	ca	1.0E-01	ca	6.0E-02	3.0E-03
		3.0E-02	i			3.0E-02	r		0.1	58-90-2	2,3,4,6-Tetrachlorophenol	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
2.0E+01	h			2.0E+01	r				0.1	5216-25-1	p,a,a,a-Tetrachlorotoluene	2.4E-02	ca	8.6E-02	ca	3.4E-04	ca	3.4E-03	ca		
2.4E-02	h	3.0E-02	i	2.4E-02	r	3.0E-02	r		0.1	961-11-5	Tetrachlorovinphos	2.0E+01	ca*	7.2E+01	ca	2.8E-01	ca	2.8E+00	ca		
		5.0E-04	i			5.0E-04	r		0.1	3689-24-5	Tetraethyldithiopyrophosphate	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
7.6E-03	n	2.1E-01	n	6.8E-03	n	8.6E-02	n	y		109-99-9	Tetrahydrofuran	9.4E+00	ca	2.1E+01	ca	9.9E-01	ca	1.6E+00	ca		
		6.6E-05	i							7440-28-0	Thallium and compounds+++	5.2E+00	nc	6.7E+01	nc			2.4E+00	nc		
		1.0E-02	i			1.0E-02	r		0.1	28249-77-6	Thiobencarb	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	n			5.0E-02	r		0.1	N/A	Thiocyanate	3.1E+03	nc	1.0E+05	max	1.8E+02	nc	1.8E+03	nc		
		3.0E-04	h			3.0E-04	r		0.1	39196-18-4	Thiofanox	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG)
ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES											CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		8.0E-02	i			8.0E-02	r		0.1	23564-05-8	Thiophanate-methyl	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	137-26-8	Thiram	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		6.0E-01	h							7440-31-5	Tin (inorganic, also see tributyltin oxide)	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		4.0E+00	n			8.6E-03	n			7440-32-6	Titanium	1.0E+05	max	1.0E+05	max	3.1E+01	nc	1.5E+05	nc		
		2.0E-01	i			1.1E-01	i	y		108-88-3	Toluene	5.2E+02	sat	5.2E+02	sat	4.0E+02	nc	7.2E+02	nc	1.2E+01	6.0E-01
3.2E+00	h			3.2E+00	r				0.1	95-80-7	Toluene-2,4-diamine	1.5E-01	ca	5.4E-01	ca	2.1E-03	ca	2.1E-02	ca		
		6.0E-01	h			6.0E-01	r		0.1	95-70-5	Toluene-2,5-diamine	3.7E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc		
		2.0E-01	h			2.0E-01	r		0.1	823-40-5	Toluene-2,6-diamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
1.9E-01	i			1.9E-01	r				0.1	106-49-0	p-Toluidine	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
1.1E+00	i			1.1E+00	i				0.1	8001-35-2	Toxaphene	4.4E-01	ca	1.6E+00	ca	6.0E-03	ca	6.1E-02	ca	3.1E+01	2.0E+00
		7.5E-03	i			7.5E-03	r		0.1	66841-25-6	Tralomethrin	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	2303-17-5	Triallate	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		1.0E-02	i			1.0E-02	r		0.1	82097-50-5	Triasulfuron	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	615-54-3	1,2,4-Tribromobenzene	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
9.2E-03	p	2.0E-01	p	9.2E-03	r	2.0E-01	r		0.1	126-73-8	**Tributyl phosphate**	5.3E+01	ca	1.9E+02	ca	7.3E-01	ca	7.3E+00	ca		
		3.0E-04	i						0.1	56-35-9	Tributyltin oxide (TBTO)	1.8E+01	nc	1.8E+02	nc			1.1E+01	nc		
3.4E-02	h			3.4E-02	r				0.1	634-93-5	2,4,6-Trichloroaniline	1.4E+01	ca	5.1E+01	ca	2.0E-01	ca	2.0E+00	ca		
2.9E-02	h			2.9E-02	r				0.1	33663-50-2	2,4,6-Trichloroaniline hydrochloride	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		1.0E-02	i			1.0E-03	p	y		120-82-1	**1,2,4-Trichlorobenzene**	6.2E+01	nc	2.2E+02	nc	3.7E+00	nc	7.2E+00	nc	5.0E+00	3.0E-01
		2.8E-01	n			6.3E-01	p	y		71-55-6	1,1,1-Trichloroethane	1.2E+03	sat	1.2E+03	sat	2.3E+03	nc	3.2E+03	nc	2.0E+00	1.0E-01
5.7E-02	i	4.0E-03	i	5.6E-02	i	4.0E-03	r	y		79-00-5	1,1,2-Trichloroethane	7.3E-01	ca*	1.6E+00	ca*	1.2E-01	ca	2.0E-01	ca	2.0E-02	9.0E-04
4.0E-01	n	3.0E-04	n	4.0E-01	n	1.0E-02	n	y		79-01-6	Trichloroethylene (TCE)	5.3E-02	ca	1.1E-01	ca	1.7E-02	ca	2.8E-02	ca	6.0E-02	3.0E-03
1.3E-02	c			7.0E-03	c	1.7E-01	c	y		79-01-6	**"CAL-Modified PRG"**	2.9E+00	ca	6.5E+00	ca	9.6E-01	ca	1.4E+00	ca		
		3.0E-01	i			2.0E-01	h	y		75-69-4	Trichlorofluoromethane	3.9E+02	nc	2.0E+03	sat	7.3E+02	nc	1.3E+03	nc		
		1.0E-01	i			1.0E-01	r		0.1	95-95-4	2,4,5-Trichlorophenol	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.7E+02	1.4E+01
1.1E-02	i	1.0E-04	n	1.1E-02	i	1.0E-04	r		0.1	88-06-2	2,4,6-Trichlorophenol	6.1E+00	nc**	6.2E+01	nc**	3.7E-01	nc**	3.6E+00	nc**	2.0E-01	8.0E-03
7.0E-02	c			7.0E-02	c				0.1	88-06-2	"CAL-Modified PRG"	6.9E+00	ca	2.5E+01	ca	9.6E-02	ca	9.6E-01	ca		
		1.0E-02	i			1.0E-02	r		0.1	93-76-5	2,4,5-Trichlorophenoxyacetic Acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		8.0E-03	i			8.0E-03	r		0.1	93-72-1	2-(2,4,5-Trichlorophenoxy) propionic acid	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		5.0E-03	i			5.0E-03	r	y		598-77-6	**1,1,2-Trichloropropane**	7.1E+01	nc	2.7E+02	nc	1.8E+01	nc	3.0E+01	nc		
2.0E+00	n	6.0E-03	i	2.0E+00	r	1.4E-03	n	y		96-18-4	**1,2,3-Trichloropropane**	3.4E-02	ca	7.6E-02	ca	3.4E-03	ca	5.6E-03	ca		
		1.0E-02	p			3.0E-04	p	y		96-19-5	**1,2,3-Trichloropropene**	5.2E+00	nc	1.7E+01	nc	1.1E+00	nc	2.2E+00	nc		
		3.0E-03	i			3.0E-03	r		0.1	58138-08-2	Tridiphane	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.0E-03	r			2.0E-03	i	y		121-44-8	Triethylamine	2.3E+01	nc	8.6E+01	nc	7.3E+00	nc	1.2E+01	nc		
7.7E-03	i	7.5E-03	i	7.7E-03	r	7.5E-03	r		0.1	1582-09-8	Trifluralin	6.3E+01	ca**	2.2E+02	ca*	8.7E-01	ca*	8.7E+00	ca*		
		1.4E-04	r			1.4E-04	n		0.1	552-30-7	Trimellitic Anhydride (TMAN)	8.6E+00	nc	8.6E+01	nc	5.1E-01	nc	5.1E+00			
		5.0E-02	p			1.7E-03	p	y		95-63-6	1,2,4-Trimethylbenzene	5.2E+01	nc	1.7E+02	nc	6.2E+00	nc	1.2E+01	nc		
		5.0E-02	p			1.7E-03	p	y		108-67-8	1,3,5-Trimethylbenzene	2.1E+01	nc	7.0E+01	nc	6.2E+00	nc	1.2E+01	nc		
3.7E-02	h			3.7E-02	r				0.1	512-56-1	Trimethyl phosphate	1.3E+01	ca	4.7E+01	ca	1.8E-01	ca	1.8E+00	ca		
		3.0E-02	i			3.0E-02	r		0.1	99-35-4	1,3,5-Trinitrobenzene	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-02	h			1.0E-02	r		0.1	479-45-8	Trinitrophenylmethylnitramine	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3.0E-02	i	5.0E-04	i	3.0E-02	r	5.0E-04	r		0.1	118-96-7	2,4,6-Trinitrotoluene	1.6E+01	ca**	5.7E+01	ca**	2.2E-01	ca**	2.2E+00	ca**		

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG)
ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		2.0E-02	p			2.0E-02	r		0.1	791-28-6	**Triphenylphosphine oxide**	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
1.4E-02	p	3.1E-01	p	1.4E-02	r	3.1E-01	r		0.1	115-96-8	**Tris(2-chloroethyl) phosphate**	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
3.2E-03	p	1.0E-01	p	3.2E-03	r	1.0E-01	r		0.1	78-42-2	**Tris(2-ethylhexyl) phosphate**	1.5E+02	ca*	5.4E+02	ca	2.1E+00	ca	2.1E+01	ca		
		2.0E-04	n							7440-61-1	Uranium (chemical toxicity only)	1.6E+01	nc	2.0E+02	nc			7.3E+00	nc		
		1.0E-03	n							7440-62-2	Vanadium and compounds	7.8E+01	nc	1.0E+03	nc			3.6E+01	nc	6.0E+03	3.0E+02
		1.0E-03	i			1.0E-03	r		0.1	1929-77-7	Vernam	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r		0.1	50471-44-8	Vinclozolin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E+00	h			5.7E-02	i	y		108-05-4	Vinyl acetate	4.3E+02	nc	1.4E+03	nc	2.1E+02	nc	4.1E+02	nc	1.7E+02	8.0E+00
1.1E-01	r	8.6E-04	r	1.1E-01	h	8.6E-04	i	y		593-60-2	Vinyl bromide (bromoethene)	1.9E-01	ca*	4.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		
1.5E+00	i	3.0E-03	i	3.1E-02	i	2.9E-02	i	y		75-01-4	Vinyl chloride (child/adult)+++	7.9E-02	ca			1.1E-01	ca	2.0E-02	ca	1.0E-02	7.0E-04
7.5E-01	i	3.0E-03	i	1.6E-02	i	2.9E-02	i	y		75-01-4	Vinyl chloride (adult)			7.5E-01	ca						
		3.0E-04	i			3.0E-04	r		0.1	81-81-2	Warfarin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		2.0E-01	i			2.9E-02	i	y	0.1	1330-20-7	**Xylenes**	2.7E+02	nc	4.2E+02	sat	1.1E+02	nc	2.1E+02	nc	2.1E+02	1.0E+01
		3.0E-01	i							7440-66-6	Zinc	2.3E+04	nc	1.0E+05	max			1.1E+04	nc	1.2E+04	6.2E+02
		3.0E-04	i							1314-84-7	Zinc phosphide	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
		5.0E-02	i			5.0E-02	r		0.1	12122-67-7	Zineb	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		

Appendix C

Additional Modeling Documentation and Results Tables

Table C-1. Algorithms for Andelman model (Revised by Schaum et al.[1994])

Exposure During Showering

Variable	Definition	Unit

Chemical selection criteria for this pathway:

a. Henry's law constant greater than or equal to 1E-5 atm-m3/mol; or

b. Chemicals that have a molecular weight less than 200

(1). Volatized chemical concentration in air

$$C_a = [(C_{aMax}/2)t_1 + C_{aMax}t_2] / (t_1 + t_2)$$

$$C_{aMax} = C_w \times f \times F_w \times t_1 / V_a$$

Where:

C_a =	concentration of contaminant in air	mg/m^3
C_{amax} =	maximum concentration of contaminant in air	mg/m^3
t_1 =	time of showering	hr
t_2 =	time after showering	hr
Cw =	water concentration	mg/L
f =	fraction of contaminant volatilized	unitless
F_w =	water flow rate	L/hr
V_a =	bathroom volume	m^3

(2). Volatilization fraction for untested chemicals

$$f_i = f_j \times [2.5/Dw^{0.67} + RT/(Da^{0.67}H)]_i / [2.5/Dw^{0.67} + RT/(Da^{0.67}H)]_j$$

Where:

f_i =	volatilization fraction for chemical i	unitless
f_j =	volatilization fraction for chemical j	unitless
Da =	diffusion coefficient in air	m^2/s
Dw =	diffusion coefficient in water	m^2/s
R =	gas constant	atm-m^3/mol-K
H =	Henry's law constant	atm-m^3/mol
T =	temperature	K

(3). Risk characterization

$$\text{Cancer Risk} = 1 - e^{-X}$$

$$X = UR \times C_a \times [(t_1 + t_2)/24\ hr] \times [ED/70\ years]$$

$$\text{Hazard Index} = [C_a/RfC] \times [(t_1 + t_2)/24\ hr]$$

Where:

C_a =	concentration of contaminant in air	mg/m^3
UR =	unit risk	m^3/mg
RfC =	reference concentration	mg/m^3
t_1 =	time of showering	hr
t_2 =	time after showering	hr
ED =	exposure duration	year
X =	exponential variable	unitless
Risk =	cancer risk	
HI =	hazard Index	

Source: Schaum et al. 1994. Exposure to volatiles in domestic water. pp. 305–321. In: Water Contamination and Health: Integration of Exposure Assessment, Toxicology, and Risk Assessment. R.G.M. Wang (ed). Marcel Dekker, Inc., New York, NY.

Table C-2. Summary of input parameters for Andelman model[a]

Exposure Scenario: Reasonable Maximum Exposure and Central Tendency for Adult

Parameter Definition	Variable	Unit	RME Value	CT Value	Selection Basis	Comment
Groundwater concentration	C_w	mg/L	Site-specific	Site-specific	S	Based on site-specific sampling results and is the lower of either the maximum or the upper 95th percentile confidence limit on the mean.
Time of showering	t_1	hr	0.25	0.1	SL	Values were recommended by U.S. EPA Region 2.
Time after showering	t_2	hr	0.33	0.15	SL	Values were recommended by U.S. EPA Region 2.
Fraction of contaminant that is volatilized	f	unitless	0.9	0.5	D	Selected from the recommended range of 0.5–0.9 by Schaum et al. (1994).
Water flow rate into the shower	F_w	L/hr	1,000	500	D	Default range for this parameter is 500–1,000 L/hr by Schaum et al. (1994).
Bathroom volume	V_a	m^3	6	16	SL	Selected from the recommended range of 6–16 by Schaum et al. (1994).
Unit risk	UR	m^3/mg	Chemical-specific	Chemical-specific	D	The most updated value from IRIS, HEAST, or other sources will be used.
Reference concentration	RfC	mg/m^3	Chemical-specific	Chemical-specific	D	The most updated value from IRIS, HEAST, or other sources will be used.
Initial contaminant concentration in water	C_{wi}	mg/L	Chemical-specific	Chemical-specific	S	Based on site-specific sampling results and statistical analysis.
Average contaminant concentration in water	C_{wav}	mg/cm^3	Calculated	Calculated		Value will be calculated using C_{wi} and methodology by Schaum et al. (1994).
Exposure frequency	EF	days/year	350	350	D	
Exposure duration	ED	year	30	9	D	Default range for this parameter is 9–30 years by Schaum et al. (1994).
Body weight	BW	kg	70	70	D	
Average time	AT	days	10,500 (non-cancer)	3,150 (non-cancer)	D	
			25,550 (cancer)	25,550 (cancer)	D	

Note: D - default
S - site- or chemical-specific
SL - selected from within the recommended range of parameter values

[a] As requested by NJDEP, the Andelman model (as modified by Schaum et al. 1994) will be used to estimate exposure to volatile chemicals in groundwater during residential use.

Table C-3. Summary of input parameters for Andelman model[a]

Exposure Scenario: Reasonable Maximum Exposure and Central Tendency for Child

Parameter Definition	Variable	Unit	RME Value	CT Value	Selection Basis	Comment
Groundwater concentration	C_w	mg/L	Site-specific	Site-specific	S	Based on site-specific sampling results and is the lower of either the maximum or the upper 95th percentile confidence limit on the mean.
Time of bathing	t_1	hr	0.45	0.14	SL	Values were recommended by U.S. EPA Region 2.
Time after bathing	t_2	hr	0.55	0.19	SL	Values were recommended by U.S. EPA Region 2.
Fraction of contaminant that is volatilized	f	unitless	0.9	0.5	D	Selected from the recommended range of 0.5–0.9 by Schaum et al. (1994).
Water flow rate into the shower	F_w	L/hr	1,000	500	D	Default range for this parameter is 500–1,000 L/hr by Schaum et al. (1994).
Bathroom volume	V_a	m^3	6	16	SL	Selected from the recommended range of 6–16 by Schaum et al. (1994).
Unit risk	UR	m^3/mg	Chemical-specific	Chemical-specific	D	The most updated value from IRIS, HEAST, or other sources will be used.
Reference concentration	RfC	mg/m^3	Chemical-specific	Chemical-specific	D	The most updated value from IRIS, HEAST, or other sources will be used.
Initial contaminant concentration in water	C_{wi}	mg/L	Chemical-specific	Chemical-specific	S	Based on site-specific sampling results and statistical analysis.
Average contaminant concentration in water	C_{wav}	mg/cm^3	Calculated	Calculated		Value will be calculated using C_{wi} and methodology by Schaum et al. (1994).
Exposure frequency	EF	days/year	350	350	D	
Exposure duration	ED	year	6	6	D	
Body weight	BW	kg	15	15	D	
Average time	AT	days	2,100 (non-cancer)	2,100 (non-cancer)	D	
			25,550 (cancer)	25,550 (cancer)	D	

Note: D - default
S - site- or chemical-specific
SL - selected from within the recommended range of parameter values

[a] As requested by NJDEP, the Andelman model (as modified by Schaum et al. 1994) will be used to estimate exposure to volatile chemicals in groundwater during residential use.

Table C-4. Showering exposure and risk characterization

Adult - Reasonable Maximum Exposure

Table C-4a. Calculations of Vapor Concentration in Shower Room for Chemicals of Concern

Chemical	C_w (mg/L)	t_1 (hr)	t_2 (hr)	f (unitless)	F_w (L/hr)	V_a (m^3)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethene isomers	2.3E-02	0.25	0.33	0.9	1,000	6	8.5E-01	6.7E-01
1,4-Dichlorobenzene	4.0E-03	0.25	0.33	0.9	1,000	6	1.5E-01	1.2E-01
4-Methylphenol	2.8E-02	0.25	0.33	0.9	1,000	6	1.1E+00	8.3E-01
Benzene	6.0E-02	0.25	0.33	0.9	1,000	6	2.2E+00	1.8E+00
Chlorobenzene	9.8E-03	0.25	0.33	0.9	1,000	6	3.7E-01	2.9E-01
Chloroethane	8.7E-03	0.25	0.33	0.9	1,000	6	3.3E-01	2.6E-01
Naphthalene	4.4E-02	0.25	0.33	0.9	1,000	6	1.7E+00	1.3E+00
Toluene	7.1E-01	0.25	0.33	0.9	1,000	6	2.7E+01	2.1E+01
Xylene isomers	1.6E-01	0.25	0.33	0.9	1,000	6	6.2E+00	4.8E+00

Note: Groundwater concentrations are based on EPCs for Group 4.

Table C-4b. Calculations of Cancer Risk and Hazard Index for Chemicals of Concern

Chemical	C_a (mg/m^3)	UR (m^3/mg)	RfC (mg/m^3)	t_1 (hr)	t_2 (hr)	ED (year)	*X* (unitless)	Risk	HI
1,2-Dichloroethene isomers	6.7E-01	NA	7.0E-02	0.25	0.33	30	NA	NA	0.23
1,4-Dichlorobenzene	1.2E-01	6.3E-03	8.0E-01	0.25	0.33	30	7.7E-06	7.7E-06	0.0036
4-Methylphenol	8.3E-01	NA	1.8E-02	0.25	0.33	30	NA	NA	1.15
Benzene	1.8E+00	7.8E-03	3.0E-02	0.25	0.33	30	1.4E-04	1.4E-04	1.4
Chlorobenzene	2.9E-01	NA	6.0E-02	0.25	0.33	30	NA	NA	0.12
Chloroethane	2.6E-01	8.3E-04	1.0E+01	0.25	0.33	30	2.2E-06	2.2E-06	0.00062
Naphthalene	1.3E+00	NA	3.0E-03	0.25	0.33	30	NA	NA	10.5
Toluene	2.1E+01	NA	4.0E-01	0.25	0.33	30	NA	NA	1.3
Xylene isomers	4.8E+00	NA	1.0E-01	0.25	0.33	30	NA	NA	1.2
							Totals:	**2E-04**	**16**

Note: UR and RfC are from U.S. EPA (2005a) or (2005b).

Table C-5. Showering exposure and risk characterization

Adult - Central Tendency

Table C-5a. Calculations of Vapor Concentration in Shower Room for Chemicals of Concern

Chemical	C_w (mg/L)	t_1 (hr)	t_2 (hr)	f (unitless)	F_w (L/hr)	V_a (m^3)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethene isomers	2.3E-02	0.1	0.15	0.5	500	16	3.6E-02	2.8E-02
1,4-Dichlorobenzene	4.0E-03	0.1	0.15	0.5	500	16	6.3E-03	5.0E-03
4-Methylphenol	2.8E-02	0.1	0.15	0.5	500	16	4.4E-02	3.5E-02
Benzene	6.0E-02	0.1	0.15	0.5	500	16	9.4E-02	7.5E-02
Chlorobenzene	9.8E-03	0.1	0.15	0.5	500	16	1.5E-02	1.2E-02
Chloroethane	8.7E-03	0.1	0.15	0.5	500	16	1.4E-02	1.1E-02
Naphthalene	4.4E-02	0.1	0.15	0.5	500	16	6.9E-02	5.5E-02
Toluene	7.1E-01	0.1	0.15	0.5	500	16	1.1E+00	8.9E-01
Xylene isomers	1.6E-01	0.1	0.15	0.5	500	16	2.6E-01	2.1E-01

Note: Groundwater concentrations are based on EPCs for Group 4.

Table C-5b. Calculations of Cancer Risk and Hazard Index for Chemicals of Concern

Chemical	C_a (mg/m^3)	UR (m^3/mg)	RfC (mg/m^3)	t_1 (hr)	t_2 (hr)	ED (year)	*X* (unitless)	Risk	HI
1,2-Dichloroethene isomers	2.8E-02	NA	7.0E-02	0.1	0.15	9	NA	NA	0.0042
1,4-Dichlorobenzene	5.0E-03	6.3E-03	8.0E-01	0.1	0.15	9	4.2E-08	4.2E-08	0.000065
4-Methylphenol	3.5E-02	NA	1.8E-02	0.1	0.15	9	NA	NA	0.021
Benzene	7.5E-02	7.8E-03	3.0E-02	0.1	0.15	9	7.8E-07	7.8E-07	0.026
Chlorobenzene	1.2E-02	NA	6.0E-02	0.1	0.15	9	NA	NA	0.0021
Chloroethane	1.1E-02	8.3E-04	1.0E+01	0.1	0.15	9	1.2E-08	1.21E-08	0.000011
Naphthalene	5.5E-02	NA	3.0E-03	0.1	0.15	9	NA	NA	0.19
Toluene	8.9E-01	NA	4.0E-01	0.1	0.15	9	NA	NA	0.023
Xylene isomers	2.1E-01	NA	1.0E-01	0.1	0.15	9	NA	NA	0.021
							Totals:	**8E-07**	**0.29**

Note: UR and RfC are from U.S. EPA (2005a) or (2005b).

Table C-6. Bathing exposure and risk characterization

Child - Reasonable Maximum Exposure

Table C-6a. Calculations of Vapor Concentration in Bathroom for Chemicals of Concern

Chemical	C_w (mg/L)	t_1 (hr)	t_2 (hr)	f (unitless)	F_w (L/hr)	V_a (m^3)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethene isomers	2.3E-02	0.45	0.55	0.9	1,000	6	1.5E+00	1.2E+00
1,4-Dichlorobenzene	4.0E-03	0.45	0.55	0.9	1,000	6	2.7E-01	2.1E-01
4-Methylphenol	2.8E-02	0.45	0.55	0.9	1,000	6	1.9E+00	1.5E+00
Benzene	6.0E-02	0.45	0.55	0.9	1,000	6	4.0E+00	3.1E+00
Chlorobenzene	9.8E-03	0.45	0.55	0.9	1,000	6	6.6E-01	5.1E-01
Chloroethane	8.7E-03	0.45	0.55	0.9	1,000	6	5.9E-01	4.6E-01
Naphthalene	4.4E-02	0.45	0.55	0.9	1,000	6	3.0E+00	2.3E+00
Toluene	7.1E-01	0.45	0.55	0.9	1,000	6	4.8E+01	3.7E+01
Xylene isomers	1.6E-01	0.45	0.55	0.9	1,000	6	1.1E+01	8.6E+00

Note: Groundwater concentrations are based on EPCs for Group 4.

Table C-6b. Calculations of Cancer Risk and Hazard Index for Chemicals of Concern

Chemical	C_a (mg/m^3)	UR (m^3/mg)	RfC (mg/m^3)	t_1 (hr)	t_2 (hr)	ED (year)	*X* (unitless)	Risk	HI
1,2-Dichloroethene isomers	1.2E+00	NA	7.0E-02	0.45	0.55	6	NA	NA	0.71
1,4-Dichlorobenzene	2.1E-01	6.3E-03	8.0E-01	0.45	0.55	6	4.7E-06	4.7E-06	0.011
4-Methylphenol	1.5E+00	NA	1.8E-02	0.45	0.55	6	NA	NA	3.5
Benzene	3.1E+00	7.8E-03	3.0E-02	0.45	0.55	6	8.7E-05	8.7E-05	4.4
Chlorobenzene	5.1E-01	NA	6.0E-02	0.45	0.55	6	NA	NA	0.36
Chloroethane	4.6E-01	8.3E-04	1.0E+01	0.45	0.55	6	1.35E-06	1.3E-06	0.0019
Naphthalene	2.3E+00	NA	3.0E-03	0.45	0.55	6	NA	NA	32.2
Toluene	3.7E+01	NA	4.0E-01	0.45	0.55	6	NA	NA	3.9
Xylene isomers	8.6E+00	NA	1.0E-01	0.45	0.55	6	NA	NA	3.6
							Totals:	**9E-05**	**49**

Note: UR and RfC are from U.S. EPA (2005a) or (2005b).

Table C-7. Bathing exposure and risk characterization

Child - Central Tendency

Table C-7a. Calculations of Vapor Concentration in Bathroom for Chemicals of Concern

Chemical	C_w (mg/L)	t_1 (hr)	t_2 (hr)	f (unitless)	F_w (L/hr)	V_a (m^3)	C_{amax} (mg/m^3)	C_a (mg/m^3)
1,2-Dichloroethene isomers	2.3E-2	0.14	0.19	0.5	500	16	5.0E-02	3.9E-02
1,4-Dichlorobenzene	4.0E-3	0.14	0.19	0.5	500	16	8.8E-03	6.9E-03
4-Methylphenol	2.8E-2	0.14	0.19	0.5	500	16	6.2E-02	4.9E-02
Benzene	6.0E-2	0.14	0.19	0.5	500	16	1.3E-01	1.0E-01
Chlorobenzene	9.8E-3	0.14	0.19	0.5	500	16	2.1E-02	1.7E-02
Chloroethane	8.7E-3	0.14	0.19	0.5	500	16	1.9E-02	1.5E-02
Naphthalene	4.4E-2	0.14	0.19	0.5	500	16	9.7E-02	7.6E-02
Toluene	7.1E-1	0.14	0.19	0.5	500	16	1.6E+00	1.2E+00
Xylene isomers	1.6E-1	0.14	0.19	0.5	500	16	3.6E-01	2.8E-01

Note: Groundwater concentrations are based on EPCs for Group 4.

Table C-7b. Calculations of Cancer Risk and Hazard Index for Chemicals of Concern

Chemical	C_a (mg/m^3)	UR (m^3/mg)	RfC (mg/m^3)	t_1 (hr)	t_2 (hr)	ED (year)	*X* (unitless)	Risk	HI
1,2-Dichloroethene isomers	3.9E-2	NA	7.0E-02	0.14	0.19	6	NA	NA	0.0077
1,4-Dichlorobenzene	6.9E-3	6.3E-03	8.0E-01	0.14	0.19	6	5.1E-08	5.1E-08	0.00012
4-Methylphenol	4.9E-2	NA	1.8E-02	0.14	0.19	6	NA	NA	0.038
Benzene	1.0E-1	7.8E-03	3.0E-02	0.14	0.19	6	9.5E-07	9.5E-07	0.047
Chlorobenzene	1.7E-2	NA	6.0E-02	0.14	0.19	6	NA	NA	0.0039
Chloroethane	1.5E-2	8.3E-04	1.0E+01	0.14	0.19	6	1.5E-08	1.5E-08	0.000021
Naphthalene	7.6E-2	NA	3.0E-03	0.14	0.19	6	NA	NA	0.35
Toluene	1.2E+0	NA	4.0E-01	0.14	0.19	6	NA	NA	0.042
Xylene isomers	2.8E-1	NA	1.0E-01	0.14	0.19	6	NA	NA	0.039
							Totals:	**1.0E-06**	**0.53**

Note: UR and RfC are from U.S. EPA (2005a) or (2005b).

Table C-8. Assumptions used in Johnson and Ettinger model

Parameter		Undeveloped Area Input	Developed Area Input	Units	Rationale
Soil Model					
Depth below grade to bottom of enclosed floor space	L_F	200	15	cm	Model default for basement (U) and slab (D) construction
Depth below grade to top of contamination	L_t	200	15	cm	Because the soil contamination begins at the surface, L_t in the soil model must be equal to L_F
Depth below grade to bottom of contamination	L_b	230	80	cm	Site specific averages calculated separately for the developed and undeveloped areas from 10/97 to 6/00 sampling periods
Thickness of soil stratum A	h_A	200	15	cm	Assume only one stratum (Stratum B and C equal 0)
Stratum A soil type		L	L		Loam (RI indicates mixed sand/silt/clay; loam is midrange for water content, porosity)
Soil dry bulk density	ρ_b^A	1.59	1.59	g/cm^3	Default from Table 5 of Model Guidance
Total soil porosity	n^A	0.399	0.399	cm^3/cm^3	Default from Table 5 of Model Guidance
Stratum A water-filled porosity	θ_w^A	0.148	0.148	cm^3/cm^3	Default from Table 5 of Model Guidance
Stratum A soil organic carbon	f_{oc}^A	0.002	0.002	unitless	Default from Table 5 of Model Guidance
Groundwater Model					
Depth below grade to bottom of enclosed floor space	L_F	200	15	cm	Model default for basement (U) and slab (D) construction
Depth below grade to water table	L_{wt}	230	80	cm	Site specific averages calculated separately for the developed and undeveloped areas from 10/97 to 6/00 sampling periods
Thickness of soil stratum A	h_A	230	80	cm	Assume only one stratum (Stratum B and C equal 0)
Soil stratum directly above water table		A	A		Assume only one stratum
Soil type directly above water table		L	L		Loam (RI indicates mixed sand/silt/clay; loam is midrange for water content, porosity)
Stratum A soil type		L	L		Loam (RI indicates mixed sand/silt/clay; loam is midrange for water content, porosity)
Soil dry bulk density	ρ_b^A	1.59	1.59	g/cm^3	default from Table 5 of Model Guidance
Total soil porosity	n^A	0.399	0.399	cm^3/cm^3	default from Table 5 of Model Guidance
Stratum A water-filled porosity	θ_w^A	0.148	0.148	cm^3/cm^3	default from Table 5 of Model Guidance

Note: All other input parameters are model defaults. Because model results for developed and undeveloped soil were similar, groundwater modeling was conducted for developed area only and exposure concentrations were conservatively applied to both developed and undeveloped area.

Table C-9. Assumptions regarding groundwater depth used in Johnson and Ettinger model

	Date									
	10/15/97	12/9/97	1/15/98	12/10/99	2/10/00	4/10/00	6/19/00	9/24/02	Mean	
Undeveloped Area Depth to Groundwater (ft)										
MW-1	8.89	8.51	7.90	8.18	8.41	8.23	8.23	8.95	8.3	
MW-1A	6.53	6.44	--	--	--	--	--	--	6.5	
MW-2	10.62	10.02	9.49	9.74	9.96	9.61	9.72	10.54	9.9	
MW-3	9.84	9.32	8.81	9.02	9.29	8.90	8.94	9.93	9.2	
MW-4	--	7.22	6.92	6.92	7.26	7.04	6.95	7.43	7.1	
MW-4A	8.72	9.09	--	--	--	--	--	--	8.9	
MW-5	9.18	8.50	8.09	8.25	8.45	8.28	8.22	8.89	8.4	
MW-6	11.98	11.34	10.88	11.07	11.20	10.98	10.95	11.36	11.2	
MW-7	5.65	4.45	3.85	3.66	4.16	4.02	3.90	5.31	4.2	
MW-12	5.44	5.42	4.87	4.65	5.19	5.16	5.04	5.58	5.1	
MW-14	--	--	--	5.30	5.56	5.33	5.45	6.15	5.4	
							Area Average (ft)		7.7	= 233 cm
Developed Area Depth to Groundwater (ft)										
MW-8	6.68	5.88	5.37	5.20	5.38	5.40	5.96	6.39	5.7	
MW-9	6.26	5.08	4.24	3.69	3.60	3.39	3.45	5.05	4.2	
MW-10	2.30	0.84	1.14	0.44	0.96	0.12	0.91	1.76	1.0	
MW-11	1.62	1.70	0.36	0.20		1.14	0.15	0.70	0.9	
MW-13	--	--	--	1.64	2.15	2.05	1.84	2.90	2.1	
MW-14	--	--	--	2.05	2.29	2.36	2.11	2.90	2.2	
							Area Average (ft)		2.7	= 82 cm

Note: -- - not measured

Table C-10. Johnson and Ettinger modeling results for Ventron/Velsicol OU1

Subsurface Soil to Indoor Air Pathway

	Undeveloped Subsurface Soil to Indoor Air			Developed Subsurface Soil to Indoor Air		
Chemical	Soil Concentration (μg/kg)	Indoor Air Concentration (μg/m^3)	Note	Soil Concentration (μg/kg)	Indoor Air Concentration (μg/m^3)	Note
Organics						
Benzene	--	--		2,800	1.28E+01	
Carbazole	3,713	6.64E-05	**A**	--	--	
Chlorobenzene	--	--		--	--	
Chloroethane	--	--		--	--	
1,2-Dichloroethene, isomers	--	--		--	--	
1,4-Dichlorobenzene	--	--		--	--	
Dibenzofuran	4,540	3.06E-07		--	--	
4-Methylphenol	--	--		--	--	
Toluene	19,097	6.82E+01		--	--	
Xylenes	31,073	1.11E+02	**B**	--	--	
PAHs						
Benz[a]anthracene	18,307	2.31E-03	**C**	--	--	
Benzo[a]pyrene	14,671	2.31E-03	**C**	--	--	
Benzo[b]fluoranthene	18,150	2.31E-03		--	--	
Benzo[ghi]perylene	2,936	1.84E-03	**C**	--	--	
Benzo[k]fluoranthene	2,511	1.57E-03	**C**	--	--	
Dibenz[a,h]anthracene	263	1.65E-04	**C**	--	--	
Indeno[1,2,3-cd]pyrene	3,085	1.93E-03	**C**	--	--	
Naphthalene	5,959	2.13E+01		--	--	
PCBs	4,400	--	**D**	360	NA	**D**
Aroclor® 1242	790	--	**D**	--	--	
Aroclor® 1248	4,400	--	**D**	--	--	
Aroclor® 1254	550	--	**D**	--	--	
Aroclor® 1260	--	--		--	--	

Note: A - Physical- and chemical-specific parameters are not available in the new version of J-E model database; modeling result was generated using parameters in previous version.

B - Average of results for the m-, o-, and p-xylenes.

C - Physical- and chemical-specific parameters are not available in the new version of J-E model database; benzo[b]fluorathene was used as a surrogate.

D - Physical- and chemical-specific parameters are not available in the J-E model database.

E - Subsurface soil concentrations for 2-methylnapthalene in the developed area were evaluated based on data for the undeveloped area because of limited sampling data in developed area.

Table C-11. Johnson and Ettinger modeling results for Ventron/Velsicol OU1

Groundwater to Indoor Air Pathway

		Undeveloped Groundwater to Indoor Air		Developed Groundwater to Indoor Air	
Chemical	Water Concentration (μg/L)	Indoor Air Concentration (μg/m^3)	Note	Indoor Air Concentration (μg/m^3)	Note
Organics					
Benzene	60	1.03E+00		6.14E-01	
Carbazole	--	--		--	
Chlorobenzene	10	9.38E-02		5.56E-02	
Chloroethane	8.7	7.47E-01		4.57E-01	
1,2-Dichloroethene, isomers	23	4.31E-01	**A**	2.55E-01	**A**
1,4-Dichlorobenzene	4	2.38E-02		1.41E-02	
Dibenzofuran	--	--		--	
4-Methylphenol	28	--	**B**	--	**B**
Toluene	711	1.28E+01		7.62E+00	
Xylenes	164	2.49E+00	**C**	1.47E+00	**C**
PAHs					
Benz[a]anthracene	--	--		--	
Benzo[a]pyrene	--	--		--	
Benzo[b]fluoranthene	--	--		--	
Benzo[ghi]perylene	--	--		--	
Benzo[k]fluoranthene	--	--		--	
Dibenz[a,h]anthracene	--	--		--	
Indeno[1,2,3-cd]pyrene	--	--		--	
Naphthalene	44	1.10E-01		6.53E-02	
PCBs	--	--		--	
Aroclor® 1242	--	--		--	
Aroclor® 1248	--	--		--	
Aroclor® 1254	--	--		--	
Aroclor® 1260	--	--		--	

Note: A - Average of results for the cis- and trans- isomers.
B - Physical- and chemical-specific parameters are not available in the J-E model database.
C - Average of results for the m-, o-, and p-xylenes.

Appendix D

Adult Lead Model Documentation and Results Tables

Table D.1 - Adult Lead Model Results

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface soil (unpaved only)
Exposure Point: Developed Area surface soil
Receptor Population: Long-Term Worker
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration average	ug/g or ppm	213
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	219
AT_S	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.3**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**6.4**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1.1%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_S/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal,\ 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.2 - Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil/sediment
Exposure Medium: Surface soil (all surface soil)
Exposure Point: Developed Area surface soil
Receptor Population: Long-Term Worker
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration average	ug/g or ppm	112
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	219
AT_S	Averaging time	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.1**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**6.0**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.9%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_S/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal,\ 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.3 - Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface soil
Exposure Point: Developed area subsurface soil (1-20 ft depths)
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration	ug/g or ppm	148
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	25
AT_S	Averaging time	days/yr	35
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.2**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**6.3**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1.0%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_S/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal,\ 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.4 - Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Undeveloped Area surface soil (without outlier)
Receptor Population: Long-Term Worker
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration average	ug/g or ppm	642
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	219
AT_S	Averaging time	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.9**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**8.2**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2.6%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_S/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal, 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.5. Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Undeveloped Area surface soil (average with outlier)
Receptor Population: Long-Term Worker
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration hot spot (average including 47,600 ppm)	ug/g or ppm	2110
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	219
AT_S	Averaging time	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.0**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**14.1**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**12.6%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_{S*}FI/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal, 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.6- Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Undeveloped Area surface soil (without outlier)
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration average	ug/g or ppm	642
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	65
AT_S	Averaging time	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.3**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**6.3**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1.1%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_S/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal,\ 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.7 - Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface soil
Exposure Point: Undeveloped Area surface soil (average with outlier)
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration hot spot (average including 47,600 ppm)	ug/g or ppm	2110
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	65
AT_S	Averaging time	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.9**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**8.1**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**2.6%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_{S*}FI/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal,\ 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Table D.8. Adult Lead Model Results

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface soil
Exposure Point: Undeveloped area subsurface soil (1-20 ft depths)
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Variable	Description of Exposure Variable	Units	NE Region, All Races PbB_0 = 1.98 GSDi = 2.00
PbS	Soil lead concentration average	ug/g or ppm	2096
$R_{fetal/maternal}$	Fetal/maternal blood lead (PbB) ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	2.0
PbB_0	Baseline PbB	ug/dL	1.98
IR_S	Soil ingestion rate	g/day	0.050
AF_S	Absorption fraction	--	0.12
EF_S	Exposure frequency	days/yr	25
AT_S	Averaging time	days/yr	35
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.6**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**15.7**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**16.0%**

$$\mathbf{PbB}_{\mathbf{adult}} = (PbS*BKSF*IR_{S+D}*AF_S*EF_S/AT_S) + PbB_0$$

$$\mathbf{PbB}_{\mathbf{fetal,\ 0.95}} = PbB_{adult} * (GSD_i^{1.645} * R)$$

Appendix E

ProUCL Output

Appendix E-1

Output for Developed Area Surface Soil Current

	Arsenic (mg/kg dry)	Chromium (mg/kg dry)	Copper (mg/kg dry)	Lead (mg/kg dry)	Manganese (mg/kg dry)	Mercury (mg/kg dry)	Vanadium (mg/kg dry)	Benzo[a] pyrene (µg/kg dry)	Benzo[b] fluoranthene (µg/kg dry)	Dibenz[a,h] anthracene (µg/kg dry)
	11	23.8	470	390	540	310	140	200	73	200
	0.43	6.7	18.5	17.8	126	52.1	6	190	190	190
	5.8	96.9	78.7	230	400	9.3	54.8	410	750	71
N=	3	3	3	3	3	3	3	3	3	3
Mean =	5.7	42.5	189	213	355	124	66.9	267	338	154
Detected Max =	11	96.9	470	390	540	310	140	410	750	71

Appendix E-2

Output for Developed Area Surface Soil Future

Data File

Variable: Arsenic (mg/kg dry)

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	9
Minimum	0.43
Maximum	11
Mean	4.323
Median	3.8
Standard Deviation	3.285686
Variance	10.79573
Coefficient of Variation	0.760048
Skewness	1.026187

Gamma Statistics	
k hat	1.693568
k star (bias corrected)	1.252164
Theta hat	2.552599
Theta star	3.452422
nu hat	33.87136
nu star	25.04329
Approx.Chi Square Value (.05)	14.64299
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	13.27887

Log-transformed Statistics	
Minimum of log data	-0.84397
Maximum of log data	2.397895
Mean of log data	1.140545
Standard Deviation of log data	0.94742
Variance of log data	0.897604

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

6.22765

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.915466
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.22765

Gamma Distribution Test	
A-D Test Statistic	0.164369
A-D 5% Critical Value	0.737817
K-S Test Statistic	0.138593
K-S 5% Critical Value	0.270613
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	7.393445
Adjusted Gamma UCL	8.152963

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.947747
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	12.62355
95% Chebyshev (MVUE) UCL	10.93451
97.5% Chebyshev (MVUE) UCL	13.6661
99% Chebyshev (MVUE) UCL	19.03178

95% Non-parametric UCLs	
CLT UCL	6.032044
Adj-CLT UCL (Adjusted for skewness)	6.392319
Mod-t UCL (Adjusted for skewness)	6.283846
Jackknife UCL	6.22765
Standard Bootstrap UCL	5.942757
Bootstrap-t UCL	7.077066
Hall's Bootstrap UCL	8.255699
Percentile Bootstrap UCL	6.023
BCA Bootstrap UCL	5.73
95% Chebyshev (Mean, Sd) UCL	8.852006
97.5% Chebyshev (Mean, Sd) UCL	10.81171
99% Chebyshev (Mean, Sd) UCL	14.66117

Data File

Variable: Chromium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	10
Minimum	6.6
Maximum	131
Mean	33.96
Median	14.5
Standard Deviation	43.2762
Variance	1872.829
Coefficient of Variation	1.274329
Skewness	1.856054

Gamma Statistics	
k hat	1.04922
k star (bias corrected)	0.801121
Theta hat	32.36691
Theta star	42.39063
nu hat	20.9844
nu star	16.02241
Approx.Chi Square Value (.05)	7.976729
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	7.012207

Log-transformed Statistics	
Minimum of log data	1.88707
Maximum of log data	4.875197
Mean of log data	2.978095
Standard Deviation of log data	1.014086
Variance of log data	1.028371

RECOMMENDATION

Data are lognormal (0.05)

Use 95% Chebyshev (MVUE) UCL

75.63302

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.653452
Shapiro-Wilk 5% Critical Value	0.842
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	59.0464

Gamma Distribution Test	
A-D Test Statistic	1.020168
A-D 5% Critical Value	0.74738
K-S Test Statistic	0.302687
K-S 5% Critical Value	0.273491
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	68.21356
Adjusted Gamma UCL	77.59626

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.861914
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	94.72357
95% Chebyshev (MVUE) UCL	75.63302
97.5% Chebyshev (MVUE) UCL	95.09172
99% Chebyshev (MVUE) UCL	133.3146

95% Non-parametric UCLs	
CLT UCL	56.47004
Adj-CLT UCL (Adjusted for skewness)	65.05267
Mod-t UCL (Adjusted for skewness)	60.38511
Jackknife UCL	59.0464
Standard Bootstrap UCL	55.50613
Bootstrap-t UCL	174.1403
Hall's Bootstrap UCL	207.3399
Percentile Bootstrap UCL	57.5
BCA Bootstrap UCL	53.47
95% Chebyshev (Mean, Sd) UCL	93.61212
97.5% Chebyshev (Mean, Sd) UCL	119.4236
99% Chebyshev (Mean, Sd) UCL	170.1254

Data File

Variable: Copper (mg/kg dry)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	12.4
Maximum	7420
Mean	652.8
Median	59
Standard Deviation	2036.796
Variance	4148537
Coefficient of Variation	3.120091
Skewness	3.584222

Gamma Statistics	
k hat	0.320568
k star (bias corrected)	0.297872
Theta hat	2036.389
Theta star	2191.542
nu hat	8.334755
nu star	7.744683
Approx.Chi Square Value (.05)	2.587415
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	2.182487

Log-transformed Statistics	
Minimum of log data	2.517696
Maximum of log data	8.911934
Mean of log data	4.353353
Standard Deviation of log data	1.658646
Variance of log data	2.751108

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

6273.539

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.347458
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1659.624

Gamma Distribution Test	
A-D Test Statistic	2.428669
A-D 5% Critical Value	0.825702
K-S Test Statistic	0.38311
K-S 5% Critical Value	0.255668
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1953.969
Adjusted Gamma UCL	2316.499

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.81175
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2212.77
95% Chebyshev (MVUE) UCL	813.5629
97.5% Chebyshev (MVUE) UCL	1056.794
99% Chebyshev (MVUE) UCL	1534.574

95% Non-parametric UCLs	
CLT UCL	1581.987
Adj-CLT UCL (Adjusted for skewness)	2182.026
Mod-t UCL (Adjusted for skewness)	1753.218
Jackknife UCL	1659.624
Standard Bootstrap UCL	1548.596
Bootstrap-t UCL	39132.34
Hall's Bootstrap UCL	15377.63
Percentile Bootstrap UCL	1780.031
BCA Bootstrap UCL	2377
95% Chebyshev (Mean, Sd) UCL	3115.166
97.5% Chebyshev (Mean, Sd) UCL	4180.634
99% Chebyshev (Mean, Sd) UCL	6273.539

Data File

Variable: Lead (mg/kg dry)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	13
Minimum	17.8
Maximum	390
Mean	111.8154
Median	68.7
Standard Deviation	120.4441
Variance	14506.79
Coefficient of Variation	1.077169
Skewness	1.524896

Gamma Statistics	
k hat	1.170051
k star (bias corrected)	0.951322
Theta hat	95.56451
Theta star	117.5369
nu hat	30.42134
nu star	24.73436
Approx.Chi Square Value (.05)	14.40672
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	13.29407

Log-transformed Statistics	
Minimum of log data	2.879198
Maximum of log data	5.966147
Mean of log data	4.232128
Standard Deviation of log data	1.009477
Variance of log data	1.019044

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

191.9717

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.763621
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	171.353

Gamma Distribution Test	
A-D Test Statistic	0.602299
A-D 5% Critical Value	0.754995
K-S Test Statistic	0.194061
K-S 5% Critical Value	0.242316
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	191.9717
Adjusted Gamma UCL	208.0388

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.936754
Shapiro-Wilk 5% Critical Value	0.866
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	264.8853
95% Chebyshev (MVUE) UCL	251.6237
97.5% Chebyshev (MVUE) UCL	313.5049
99% Chebyshev (MVUE) UCL	435.0587

95% Non-parametric UCLs	
CLT UCL	166.762
Adj-CLT UCL (Adjusted for skewness)	181.8581
Mod-t UCL (Adjusted for skewness)	173.7077
Jackknife UCL	171.353
Standard Bootstrap UCL	165.4737
Bootstrap-t UCL	217.6824
Hall's Bootstrap UCL	180.0659
Percentile Bootstrap UCL	166.9231
BCA Bootstrap UCL	196.0846
95% Chebyshev (Mean, Sd) UCL	257.4252
97.5% Chebyshev (Mean, Sd) UCL	320.4307
99% Chebyshev (Mean, Sd) UCL	444.1928

Data File

Variable: Manganese (mg/kg dry)

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	9
Minimum	110
Maximum	540
Mean	262.8
Median	225.5
Standard Deviation	137.7436
Variance	18973.29
Coefficient of Variation	0.524138
Skewness	0.837836

Gamma Statistics	
k hat	4.168363
k star (bias corrected)	2.984521
Theta hat	63.04633
Theta star	88.05434
nu hat	83.36726
nu star	59.69042
Approx.Chi Square Value (.05)	42.92199
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	40.46151

Log-transformed Statistics	
Minimum of log data	4.70048
Maximum of log data	6.291569
Mean of log data	5.446673
Standard Deviation of log data	0.532115
Variance of log data	0.283146

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

342.6473

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.921754
Shapiro-Wilk 5% Critical Value	0.842
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	342.6473

Gamma Distribution Test	
A-D Test Statistic	0.264326
A-D 5% Critical Value	0.7294
K-S Test Statistic	0.167454
K-S 5% Critical Value	0.267754
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	365.4686
Adjusted Gamma UCL	387.693

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.950785
Shapiro-Wilk 5% Critical Value	0.842
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	399.4597
95% Chebyshev (MVUE) UCL	459.9762
97.5% Chebyshev (MVUE) UCL	545.1515
99% Chebyshev (MVUE) UCL	712.4619

95% Non-parametric UCLs	
CLT UCL	334.4471
Adj-CLT UCL (Adjusted for skewness)	346.7784
Mod-t UCL (Adjusted for skewness)	344.5708
Jackknife UCL	342.6473
Standard Bootstrap UCL	330.4761
Bootstrap-t UCL	356.2687
Hall's Bootstrap UCL	361.0857
Percentile Bootstrap UCL	336.3
BCA Bootstrap UCL	319.7
95% Chebyshev (Mean, Sd) UCL	452.6664
97.5% Chebyshev (Mean, Sd) UCL	534.8217
99% Chebyshev (Mean, Sd) UCL	696.2

Data File

Variable: Mercury (mg/kg dry) without outlier

Raw Statistics	
Number of Valid Samples	14
Number of Unique Samples	13
Minimum	9.3
Maximum	2250
Mean	688.1643
Median	525
Standard Deviation	714.9998
Variance	511224.8
Coefficient of Variation	1.038996
Skewness	1.13176

Gamma Statistics	
k hat	0.769919
k star (bias corrected)	0.652556
Theta hat	893.8137
Theta star	1054.568
nu hat	21.55774
nu star	18.27155
Approx.Chi Square Value (.05)	9.586009
Adjusted Level of Significance	0.03122
Adjusted Chi Square Value	8.761516

Log-transformed Statistics	
Minimum of log data	2.230014
Maximum of log data	7.718685
Mean of log data	5.759242
Standard Deviation of log data	1.575142
Variance of log data	2.481071

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

1311.686

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.851918
Shapiro-Wilk 5% Critical Value	0.874
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1026.575

Gamma Distribution Test	
A-D Test Statistic	0.211236
A-D 5% Critical Value	0.769771
K-S Test Statistic	0.127609
K-S 5% Critical Value	0.237394
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1311.686
Adjusted Gamma UCL	1435.121

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.933122
Shapiro-Wilk 5% Critical Value	0.874
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	5897.403
95% Chebyshev (MVUE) UCL	2860.363
97.5% Chebyshev (MVUE) UCL	3695.415
99% Chebyshev (MVUE) UCL	5335.712

95% Non-parametric UCLs	
CLT UCL	1002.482
Adj-CLT UCL (Adjusted for skewness)	1064.243
Mod-t UCL (Adjusted for skewness)	1036.208
Jackknife UCL	1026.575
Standard Bootstrap UCL	991.5568
Bootstrap-t UCL	1137.774
Hall's Bootstrap UCL	1078.415
Percentile Bootstrap UCL	995.4143
BCA Bootstrap UCL	944.7214
95% Chebyshev (Mean, Sd) UCL	1521.114
97.5% Chebyshev (Mean, Sd) UCL	1881.532
99% Chebyshev (Mean, Sd) UCL	2589.503

Data File

Variable: Mercury (mg/kg dry)

Raw Statistics	
Number of Valid Samples	15
Number of Unique Samples	14
Minimum	9.3
Maximum	13800
Mean	1562.287
Median	540
Standard Deviation	3454.86
Variance	11936058
Coefficient of Variation	2.211412
Skewness	3.618629

Gamma Statistics	
k hat	0.476482
k star (bias corrected)	0.42563
Theta hat	3278.798
Theta star	3670.531
nu hat	14.29445
nu star	12.76889
Approx.Chi Square Value (.05)	5.736593
Adjusted Level of Significance	0.03235
Adjusted Chi Square Value	5.166669

Log-transformed Statistics	
Minimum of log data	2.230014
Maximum of log data	9.532424
Mean of log data	6.010787
Standard Deviation of log data	1.803601
Variance of log data	3.252978

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Adjusted Gamma UCL

3861.031

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.452097
Shapiro-Wilk 5% Critical Value	0.881
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3133.447

Gamma Distribution Test	
A-D Test Statistic	0.602728
A-D 5% Critical Value	0.79799
K-S Test Statistic	0.162496
K-S 5% Critical Value	0.23454
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3477.441
Adjusted Gamma UCL	3861.031

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.979228
Shapiro-Wilk 5% Critical Value	0.881
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	15580.92
95% Chebyshev (MVUE) UCL	5515.678
97.5% Chebyshev (MVUE) UCL	7187.267
99% Chebyshev (MVUE) UCL	10470.78

95% Non-parametric UCLs	
CLT UCL	3029.564
Adj-CLT UCL (Adjusted for skewness)	3920.124
Mod-t UCL (Adjusted for skewness)	3272.357
Jackknife UCL	3133.447
Standard Bootstrap UCL	2979.509
Bootstrap-t UCL	8164.124
Hall's Bootstrap UCL	8286.137
Percentile Bootstrap UCL	3292.587
BCA Bootstrap UCL	4435.76
95% Chebyshev (Mean, Sd) UCL	5450.603
97.5% Chebyshev (Mean, Sd) UCL	7133.081
99% Chebyshev (Mean, Sd) UCL	10437.98

Data File

Variable: Thallium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	11
Minimum	0.42
Maximum	5.4
Mean	1.165385
Median	0.8
Standard Deviation	1.341974
Variance	1.800894
Coefficient of Variation	1.151529
Skewness	3.041746

Gamma Statistics	
k hat	1.737048
k star (bias corrected)	1.387473
Theta hat	0.670899
Theta star	0.839933
nu hat	45.16326
nu star	36.0743
Approx.Chi Square Value (.05)	23.32626
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	21.87394

Log-transformed Statistics	
Minimum of log data	-0.867501
Maximum of log data	1.686399
Mean of log data	-0.161607
Standard Deviation of log data	0.710039
Variance of log data	0.504155

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL
2.787752

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.562228
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.828746

Gamma Distribution Test	
A-D Test Statistic	1.208107
A-D 5% Critical Value	0.746917
K-S Test Statistic	0.244676
K-S 5% Critical Value	0.240205
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.802279
Adjusted Gamma UCL	1.921942

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.846172
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.787561
95% Chebyshev (MVUE) UCL	2.031478
97.5% Chebyshev (MVUE) UCL	2.447651
99% Chebyshev (MVUE) UCL	3.265142

95% Non-parametric UCLs	
CLT UCL	1.777593
Adj-CLT UCL (Adjusted for skewness)	2.113102
Mod-t UCL (Adjusted for skewness)	1.881078
Jackknife UCL	1.828746
Standard Bootstrap UCL	1.78107
Bootstrap-t UCL	3.836797
Hall's Bootstrap UCL	4.345465
Percentile Bootstrap UCL	1.853846
BCA Bootstrap UCL	2.388462
95% Chebyshev (Mean, Sd) UCL	2.787752
97.5% Chebyshev (Mean, Sd) UCL	3.489751
99% Chebyshev (Mean, Sd) UCL	4.868694

Data File

Variable: Vanadium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	9
Number of Unique Samples	9
Minimum	6
Maximum	140
Mean	37.28889
Median	20.8
Standard Deviation	41.41007
Variance	1714.794
Coefficient of Variation	1.11052
Skewness	2.308712

Gamma Statistics	
k hat	1.378007
k star (bias corrected)	0.992746
Theta hat	27.06001
Theta star	37.56137
nu hat	24.80413
nu star	17.86942
Approx.Chi Square Value (.05)	9.295195
Adjusted Level of Significance	0.02308
Adjusted Chi Square Value	8.024571

Log-transformed Statistics	
Minimum of log data	1.791759
Maximum of log data	4.941642
Mean of log data	3.21388
Standard Deviation of log data	0.91841
Variance of log data	0.843477

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

71.68552

N<10, use Max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.706812
Shapiro-Wilk 5% Critical Value	0.829
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	62.95689

Gamma Distribution Test	
A-D Test Statistic	0.431978
A-D 5% Critical Value	0.736583
K-S Test Statistic	0.23731
K-S 5% Critical Value	0.284692
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	71.68552
Adjusted Gamma UCL	83.03632

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.97359
Shapiro-Wilk 5% Critical Value	0.829
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	104.3011
95% Chebyshev (MVUE) UCL	84.98217
97.5% Chebyshev (MVUE) UCL	106.2971
99% Chebyshev (MVUE) UCL	148.1662

95% Non-parametric UCLs	
CLT UCL	59.99339
Adj-CLT UCL (Adjusted for skewness)	71.34385
Mod-t UCL (Adjusted for skewness)	64.72733
Jackknife UCL	62.95689
Standard Bootstrap UCL	58.87229
Bootstrap-t UCL	111.0801
Hall's Bootstrap UCL	144.9986
Percentile Bootstrap UCL	62.18889
BCA Bootstrap UCL	58.64444
95% Chebyshev (Mean, Sd) UCL	97.45632
97.5% Chebyshev (Mean, Sd) UCL	123.4908
99% Chebyshev (Mean, Sd) UCL	174.6305

Data File

Variable: Benzene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	10
Number of Unique Samples	7
Minimum	5
Maximum	2800
Mean	287.7
Median	5.75
Standard Deviation	882.7598
Variance	779264.8
Coefficient of Variation	3.068334
Skewness	3.161909

Gamma Statistics	
k hat	0.231995
k star (bias corrected)	0.229063
Theta hat	1240.113
Theta star	1255.985
nu hat	4.6399
nu star	4.581263
Approx.Chi Square Value (.05)	0.963529
Adjusted Level of Significance	0.0267
Adjusted Chi Square Value	0.712006

Log-transformed Statistics	
Minimum of log data	1.609438
Maximum of log data	7.937375
Mean of log data	2.56329
Standard Deviation of log data	1.956205
Variance of log data	3.826739

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

3065.239

Recommended UCL exceeds the maximum observation, use max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.3707
Shapiro-Wilk 5% Critical Value	0.842
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	799.4192

Gamma Distribution Test	
A-D Test Statistic	2.809899
A-D 5% Critical Value	0.841046
K-S Test Statistic	0.450107
K-S 5% Critical Value	0.292084
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1367.919
Adjusted Gamma UCL	1851.15

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.538272
Shapiro-Wilk 5% Critical Value	0.842
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2768.211
95% Chebyshev (MVUE) UCL	224.1771
97.5% Chebyshev (MVUE) UCL	295.5263
99% Chebyshev (MVUE) UCL	435.6781

95% Non-parametric UCLs	
CLT UCL	746.8661
Adj-CLT UCL (Adjusted for skewness)	1045.111
Mod-t UCL (Adjusted for skewness)	845.9393
Jackknife UCL	799.4192
Standard Bootstrap UCL	719.2529
Bootstrap-t UCL	210678.9
Hall's Bootstrap UCL	137427.3
Percentile Bootstrap UCL	844.35
BCA Bootstrap UCL	1128.1
95% Chebyshev (Mean, Sd) UCL	1504.5
97.5% Chebyshev (Mean, Sd) UCL	2031.011
99% Chebyshev (Mean, Sd) UCL	3065.239

Data File

Variable: Benz[a]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	12
Minimum	150
Maximum	1400
Mean	504.75
Median	325
Standard Deviation	381.2628
Variance	145361.3
Coefficient of Variation	0.75535
Skewness	1.381214

Gamma Statistics	
k hat	2.289172
k star (bias corrected)	1.772435
Theta hat	220.4945
Theta star	284.7778
nu hat	54.94014
nu star	42.53844
Approx.Chi Square Value (.05)	28.5832
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	26.84687

Log-transformed Statistics	
Minimum of log data	5.010635
Maximum of log data	7.244228
Mean of log data	5.990021
Standard Deviation of log data	0.702252
Variance of log data	0.493158

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

751.185

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.834825
Shapiro-Wilk 5% Critical Value	0.859
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	702.407

Gamma Distribution Test	
A-D Test Statistic	0.441579
A-D 5% Critical Value	0.740794
K-S Test Statistic	0.228265
K-S 5% Critical Value	0.24822
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	751.185
Adjusted Gamma UCL	799.7684

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.94955
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	852.7331
95% Chebyshev (MVUE) UCL	958.2018
97.5% Chebyshev (MVUE) UCL	1156.971
99% Chebyshev (MVUE) UCL	1547.414

95% Non-parametric UCLs	
CLT UCL	685.7844
Adj-CLT UCL (Adjusted for skewness)	732.6748
Mod-t UCL (Adjusted for skewness)	709.721
Jackknife UCL	702.407
Standard Bootstrap UCL	676.9208
Bootstrap-t UCL	807.155
Hall's Bootstrap UCL	738.9479
Percentile Bootstrap UCL	690.25
BCA Bootstrap UCL	652.1667
95% Chebyshev (Mean, Sd) UCL	984.4951
97.5% Chebyshev (Mean, Sd) UCL	1192.081
99% Chebyshev (Mean, Sd) UCL	1599.844

Data File

Variable: Benzo[a]pyrene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	12
Minimum	120
Maximum	1100
Mean	430.1667
Median	370
Standard Deviation	276.3367
Variance	76361.97
Coefficient of Variation	0.642394
Skewness	1.382054

Gamma Statistics	
k hat	2.971825
k star (bias corrected)	2.284424
Theta hat	144.7483
Theta star	188.3042
nu hat	71.3238
nu star	54.82619
Approx.Chi Square Value (.05)	38.80867
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	36.76008

Log-transformed Statistics	
Minimum of log data	4.787492
Maximum of log data	7.003065
Mean of log data	5.886592
Standard Deviation of log data	0.627384
Variance of log data	0.39361

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

573.4271

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.889541
Shapiro-Wilk 5% Critical Value	0.859
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	573.4271

Gamma Distribution Test	
A-D Test Statistic	0.153107
A-D 5% Critical Value	0.739081
K-S Test Statistic	0.095831
K-S 5% Critical Value	0.247442
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	607.7094
Adjusted Gamma UCL	641.5764

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.992567
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	678.6802
95% Chebyshev (MVUE) UCL	781.9813
97.5% Chebyshev (MVUE) UCL	934.1377
99% Chebyshev (MVUE) UCL	1233.02

95% Non-parametric UCLs	
CLT UCL	561.3792
Adj-CLT UCL (Adjusted for skewness)	595.3857
Mod-t UCL (Adjusted for skewness)	578.7315
Jackknife UCL	573.4271
Standard Bootstrap UCL	556.6581
Bootstrap-t UCL	628.7863
Hall's Bootstrap UCL	815.5085
Percentile Bootstrap UCL	561.9167
BCA Bootstrap UCL	541.75
95% Chebyshev (Mean, Sd) UCL	777.8827
97.5% Chebyshev (Mean, Sd) UCL	928.3397
99% Chebyshev (Mean, Sd) UCL	1223.883

Data File

Variable: Benzo[b]fluoranthene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	12
Minimum	73
Maximum	1400
Mean	531.3333
Median	430
Standard Deviation	371.6025
Variance	138088.4
Coefficient of Variation	0.699377
Skewness	1.167969

Gamma Statistics	
k hat	2.149886
k star (bias corrected)	1.66797
Theta hat	247.1449
Theta star	318.5509
nu hat	51.59726
nu star	40.03128
Approx.Chi Square Value (.05)	26.53245
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	24.86509

Log-transformed Statistics	
Minimum of log data	4.290459
Maximum of log data	7.244228
Mean of log data	6.025146
Standard Deviation of log data	0.797337
Variance of log data	0.635747

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

723.9822

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.90324
Shapiro-Wilk 5% Critical Value	0.859
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	723.9822

Gamma Distribution Test	
A-D Test Statistic	0.205799
A-D 5% Critical Value	0.741144
K-S Test Statistic	0.144666
K-S 5% Critical Value	0.248379
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	801.6581
Adjusted Gamma UCL	855.4142

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.958569
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1053.449
95% Chebyshev (MVUE) UCL	1130.506
97.5% Chebyshev (MVUE) UCL	1381.597
99% Chebyshev (MVUE) UCL	1874.817

95% Non-parametric UCLs	
CLT UCL	707.7807
Adj-CLT UCL (Adjusted for skewness)	746.4272
Mod-t UCL (Adjusted for skewness)	730.0103
Jackknife UCL	723.9822
Standard Bootstrap UCL	694.4065
Bootstrap-t UCL	797.5769
Hall's Bootstrap UCL	819.2579
Percentile Bootstrap UCL	705.6667
BCA Bootstrap UCL	673.9167
95% Chebyshev (Mean, Sd) UCL	998.9229
97.5% Chebyshev (Mean, Sd) UCL	1201.249
99% Chebyshev (Mean, Sd) UCL	1598.68

Data File

Variable: Dibenz[a,h]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	10
Minimum	50
Maximum	200
Mean	123.4417
Median	106.15
Standard Deviation	57.63533
Variance	3321.832
Coefficient of Variation	0.466903
Skewness	0.192417

Gamma Statistics	
k hat	4.640442
k star (bias corrected)	3.535887
Theta hat	26.60127
Theta star	34.91109
nu hat	111.3706
nu star	84.86129
Approx.Chi Square Value (.05)	64.62437
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	61.93495

Log-transformed Statistics	
Minimum of log data	3.912023
Maximum of log data	5.298317
Mean of log data	4.704168
Standard Deviation of log data	0.508221
Variance of log data	0.258289

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

153.3214

Recommended UCL exceeds the detected max, use max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.873261
Shapiro-Wilk 5% Critical Value	0.859
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	153.3214

Gamma Distribution Test	
A-D Test Statistic	0.54076
A-D 5% Critical Value	0.733364
K-S Test Statistic	0.20835
K-S 5% Critical Value	0.246099
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	162.097
Adjusted Gamma UCL	169.1358

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.897839
Shapiro-Wilk 5% Critical Value	0.859
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	174.6769
95% Chebyshev (MVUE) UCL	205.481
97.5% Chebyshev (MVUE) UCL	240.6727
99% Chebyshev (MVUE) UCL	309.8002

95% Non-parametric UCLs	
CLT UCL	150.8086
Adj-CLT UCL (Adjusted for skewness)	151.796
Mod-t UCL (Adjusted for skewness)	153.4754
Jackknife UCL	153.3214
Standard Bootstrap UCL	149.786
Bootstrap-t UCL	153.7349
Hall's Bootstrap UCL	147.0492
Percentile Bootstrap UCL	149.5833
BCA Bootstrap UCL	158
95% Chebyshev (Mean, Sd) UCL	195.9645
97.5% Chebyshev (Mean, Sd) UCL	227.3452
99% Chebyshev (Mean, Sd) UCL	288.9866

Appendix E-3

Output for Undeveloped Area Surface Soil

Data File

Variable: Antimony (mg/kg dry)

Raw Statistics	
Number of Valid Samples	31
Number of Unique Samples	28
Minimum	0.11
Maximum	53.7
Mean	5.1272903
Median	2.3
Standard Deviation	10.146132
Variance	102.94399
Coefficient of Variation	1.9788487
Skewness	4.0255708

Gamma Statistics	
k hat	0.5733071
k star (bias corrected)	0.5393311
Theta hat	8.9433575
Theta star	9.5067574
nu hat	35.54504
nu star	33.438531
Approx.Chi Square Value (.05)	21.213953
Adjusted Level of Significance	0.0413
Adjusted Chi Square Value	20.67189

Log-transformed Statistics	
Minimum of log data	-2.207275
Maximum of log data	3.983413
Mean of log data	0.5495244
Standard Deviation of log data	1.5136954
Variance of log data	2.2912738

RECOMMENDATION

Data are lognormal (0.05)

Use 95% Chebyshev (MVUE) UCL

12.69119

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.49792
Shapiro-Wilk 5% Critical Value	0.929
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	8.220207

Gamma Distribution Test	
A-D Test Statistic	1.04115
A-D 5% Critical Value	0.803317
K-S Test Statistic	0.167564
K-S 5% Critical Value	0.165942
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	8.0819
Adjusted Gamma UCL	8.293826

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.967965
Shapiro-Wilk 5% Critical Value	0.929
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	12.81778
95% Chebyshev (MVUE) UCL	12.69119
97.5% Chebyshev (MVUE) UCL	15.9901
99% Chebyshev (MVUE) UCL	22.47016

95% Non-parametric UCLs	
CLT UCL	8.124706
Adj-CLT UCL (Adjusted for skewness)	9.532524
Mod-t UCL (Adjusted for skewness)	8.439798
Jackknife UCL	8.220207
Standard Bootstrap UCL	7.982241
Bootstrap-t UCL	12.51299
Hall's Bootstrap UCL	18.34564
Percentile Bootstrap UCL	8.19129
BCA Bootstrap UCL	10.66955
95% Chebyshev (Mean, Sd) UCL	13.07051
97.5% Chebyshev (Mean, Sd) UCL	16.50754
99% Chebyshev (Mean, Sd) UCL	23.25894

Data File

Variable: Arsenic (mg/kg dry)

Raw Statistics	
Number of Valid Samples	32
Number of Unique Samples	29
Minimum	0.111
Maximum	26.7
Mean	7.125813
Median	6.7
Standard Deviation	6.47413
Variance	41.91436
Coefficient of Variation	0.908546
Skewness	1.64794

Gamma Statistics	
k hat	0.991958
k star (bias corrected)	0.919795
Theta hat	7.183584
Theta star	7.747173
nu hat	63.4853
nu star	58.86689
Approx.Chi Square Value (.05)	42.22337
Adjusted Level of Significance	0.0416
Adjusted Chi Square Value	41.46819

Log-transformed Statistics	
Minimum of log data	-2.198225
Maximum of log data	3.284664
Mean of log data	1.381276
Standard Deviation of log data	1.366046
Variance of log data	1.866081

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

9.93465

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.829979
Shapiro-Wilk 5% Critical Value	0.93
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	9.066292

Gamma Distribution Test	
A-D Test Statistic	0.768664
A-D 5% Critical Value	0.77596
K-S Test Statistic	0.163713
K-S 5% Critical Value	0.160127
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	9.93465
Adjusted Gamma UCL	10.11557

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.880252
Shapiro-Wilk 5% Critical Value	0.93
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	20.52442
95% Chebyshev (MVUE) UCL	22.14779
97.5% Chebyshev (MVUE) UCL	27.5764
99% Chebyshev (MVUE) UCL	38.23986

95% Non-parametric UCLs	
CLT UCL	9.008307
Adj-CLT UCL (Adjusted for skewness)	9.364556
Mod-t UCL (Adjusted for skewness)	9.121859
Jackknife UCL	9.066292
Standard Bootstrap UCL	8.97025
Bootstrap-t UCL	9.719831
Hall's Bootstrap UCL	10.29396
Percentile Bootstrap UCL	9.083438
BCA Bootstrap UCL	10.09266
95% Chebyshev (Mean, Sd) UCL	12.11446
97.5% Chebyshev (Mean, Sd) UCL	14.27306
99% Chebyshev (Mean, Sd) UCL	18.5132

Data File

Variable: Barium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	32
Number of Unique Samples	32
Minimum	0.226
Maximum	12000
Mean	838.7727
Median	254.5
Standard Deviation	2431.324
Variance	5911335
Coefficient of Variation	2.898668
Skewness	4.079195

Gamma Statistics	
k hat	0.396182
k star (bias corrected)	0.379873
Theta hat	2117.139
Theta star	2208.032
nu hat	25.35565
nu star	24.3119
Approx.Chi Square Value (.05)	14.08436
Adjusted Level of Significance	0.0416
Adjusted Chi Square Value	13.667

Log-transformed Statistics	
Minimum of log data	-1.48722
Maximum of log data	9.392662
Mean of log data	5.068423
Standard Deviation of log data	2.007289
Variance of log data	4.029211

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

5115.242

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.337944
Shapiro-Wilk 5% Critical Value	0.93
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1567.509

Gamma Distribution Test	
A-D Test Statistic	2.798337
A-D 5% Critical Value	0.833472
K-S Test Statistic	0.302175
K-S 5% Critical Value	0.166615
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1447.858
Adjusted Gamma UCL	1492.072

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.88491
Shapiro-Wilk 5% Critical Value	0.93
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4704.466
95% Chebyshev (MVUE) UCL	3139.462
97.5% Chebyshev (MVUE) UCL	4060.31
99% Chebyshev (MVUE) UCL	5869.138

95% Non-parametric UCLs	
CLT UCL	1545.733
Adj-CLT UCL (Adjusted for skewness)	1876.901
Mod-t UCL (Adjusted for skewness)	1619.164
Jackknife UCL	1567.509
Standard Bootstrap UCL	1546.37
Bootstrap-t UCL	9557.15
Hall's Bootstrap UCL	6463.624
Percentile Bootstrap UCL	1590.398
BCA Bootstrap UCL	2094.688
95% Chebyshev (Mean, Sd) UCL	2712.233
97.5% Chebyshev (Mean, Sd) UCL	3522.881
99% Chebyshev (Mean, Sd) UCL	5115.242

Data File

Variable: Cadmium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	32
Number of Unique Samples	30
Minimum	0.0313
Maximum	31.1
Mean	4.104375
Median	1.55
Standard Deviation	6.599661
Variance	43.55552
Coefficient of Variation	1.607958
Skewness	2.932165

Gamma Statistics	
k hat	0.563638
k star (bias corrected)	0.53163
Theta hat	7.281935
Theta star	7.720356
nu hat	36.07283
nu star	34.02434
Approx.Chi Square Value (.05)	21.68166
Adjusted Level of Significance	0.0416
Adjusted Chi Square Value	21.15337

Log-transformed Statistics	
Minimum of log data	-3.464137
Maximum of log data	3.437208
Mean of log data	0.305567
Standard Deviation of log data	1.725602
Variance of log data	2.977701

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

6.440864

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.624231
Shapiro-Wilk 5% Critical Value	0.93
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.082479

Gamma Distribution Test	
A-D Test Statistic	0.432171
A-D 5% Critical Value	0.804623
K-S Test Statistic	0.126287
K-S 5% Critical Value	0.163659
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	6.440864
Adjusted Gamma UCL	6.601719

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.964387
Shapiro-Wilk 5% Critical Value	0.93
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	17.19925
95% Chebyshev (MVUE) UCL	14.91962
97.5% Chebyshev (MVUE) UCL	19.02822
99% Chebyshev (MVUE) UCL	27.09877

95% Non-parametric UCLs	
CLT UCL	6.02337
Adj-CLT UCL (Adjusted for skewness)	6.669531
Mod-t UCL (Adjusted for skewness)	6.183267
Jackknife UCL	6.082479
Standard Bootstrap UCL	5.989569
Bootstrap-t UCL	7.595667
Hall's Bootstrap UCL	15.01607
Percentile Bootstrap UCL	6.157197
BCA Bootstrap UCL	7.415594
95% Chebyshev (Mean, Sd) UCL	9.189755
97.5% Chebyshev (Mean, Sd) UCL	11.3902
99% Chebyshev (Mean, Sd) UCL	15.71256

Data File

Variable: Chromium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	33
Number of Unique Samples	33
Minimum	0.931
Maximum	8230
Mean	345.0915
Median	43
Standard Deviation	1430.025
Variance	2044970
Coefficient of Variation	4.143899
Skewness	5.573352

Gamma Statistics	
k hat	0.337492
k star (bias corrected)	0.327013
Theta hat	1022.517
Theta star	1055.283
nu hat	22.27449
nu star	21.58287
Approx.Chi Square Value (.05)	12.02451
Adjusted Level of Significance	0.0419
Adjusted Chi Square Value	11.65661

Log-transformed Statistics	
Minimum of log data	-0.071496
Maximum of log data	9.015541
Mean of log data	3.839504
Standard Deviation of log data	1.678252
Variance of log data	2.816531

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

2821.967

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.242
Shapiro-Wilk 5% Critical Value	0.931
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	766.7602

Gamma Distribution Test	
A-D Test Statistic	4.554689
A-D 5% Critical Value	0.847069
K-S Test Statistic	0.305851
K-S 5% Critical Value	0.165437
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	619.407
Adjusted Gamma UCL	638.9561

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.919879
Shapiro-Wilk 5% Critical Value	0.931
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	507.507
95% Chebyshev (MVUE) UCL	463.1411
97.5% Chebyshev (MVUE) UCL	588.5468
99% Chebyshev (MVUE) UCL	834.882

95% Non-parametric UCLs	
CLT UCL	754.5537
Adj-CLT UCL (Adjusted for skewness)	1012.617
Mod-t UCL (Adjusted for skewness)	807.0129
Jackknife UCL	766.7602
Standard Bootstrap UCL	763.7223
Bootstrap-t UCL	6209.043
Hall's Bootstrap UCL	3307.903
Percentile Bootstrap UCL	830.1504
BCA Bootstrap UCL	1329.548
95% Chebyshev (Mean, Sd) UCL	1430.176
97.5% Chebyshev (Mean, Sd) UCL	1899.692
99% Chebyshev (Mean, Sd) UCL	2821.967

Data File

Variable: Copper (mg/kg dry)

Raw Statistics	
Number of Valid Samples	33
Number of Unique Samples	33
Minimum	2.73
Maximum	1010
Mean	191.313
Median	100
Standard Deviation	227.3793
Variance	51701.35
Coefficient of Variation	1.18852
Skewness	2.072094

Gamma Statistics	
k hat	0.778082
k star (bias corrected)	0.72755
Theta hat	245.8776
Theta star	262.9553
nu hat	51.35343
nu star	48.01827
Approx.Chi Square Value (.05)	33.11059
Adjusted Level of Significance	0.0419
Adjusted Chi Square Value	32.47244

Log-transformed Statistics	
Minimum of log data	1.004302
Maximum of log data	6.917706
Mean of log data	4.488334
Standard Deviation of log data	1.480662
Variance of log data	2.19236

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

277.4496

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.763474
Shapiro-Wilk 5% Critical Value	0.931
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	258.3599

Gamma Distribution Test	
A-D Test Statistic	0.139726
A-D 5% Critical Value	0.786363
K-S Test Statistic	0.066086
K-S 5% Critical Value	0.159075
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	277.4496
Adjusted Gamma UCL	282.9021

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.947242
Shapiro-Wilk 5% Critical Value	0.931
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	588.5897
95% Chebyshev (MVUE) UCL	606.4764
97.5% Chebyshev (MVUE) UCL	760.8351
99% Chebyshev (MVUE) UCL	1064.043

95% Non-parametric UCLs	
CLT UCL	256.4191
Adj-CLT UCL (Adjusted for skewness)	271.6746
Mod-t UCL (Adjusted for skewness)	260.7395
Jackknife UCL	258.3599
Standard Bootstrap UCL	254.7515
Bootstrap-t UCL	289.2167
Hall's Bootstrap UCL	289.9072
Percentile Bootstrap UCL	259.1512
BCA Bootstrap UCL	293.4273
95% Chebyshev (Mean, Sd) UCL	363.8455
97.5% Chebyshev (Mean, Sd) UCL	438.5004
99% Chebyshev (Mean, Sd) UCL	585.1455

Data File

Variable: Lead (mg/kg dry) without outlier

Raw Statistics	
Number of Valid Samples	31
Number of Unique Samples	31
Minimum	0.52
Maximum	4320
Mean	642.2694
Median	371
Standard Deviation	936.9212
Variance	877821.3
Coefficient of Variation	1.458767
Skewness	2.740497

Gamma Statistics	
k hat	0.620467
k star (bias corrected)	0.581927
Theta hat	1035.138
Theta star	1103.693
nu hat	38.46897
nu star	36.0795
Approx.Chi Square Value (.05)	23.33044
Adjusted Level of Significance	0.0413
Adjusted Chi Square Value	22.75973

Log-transformed Statistics	
Minimum of log data	-0.653926
Maximum of log data	8.371011
Mean of log data	5.474073
Standard Deviation of log data	1.841825
Variance of log data	3.392318

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

993.2412

USE MEAN FOR LEAD MODEL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.641223
Shapiro-Wilk 5% Critical Value	0.929
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	927.8776

Gamma Distribution Test	
A-D Test Statistic	0.529167
A-D 5% Critical Value	0.799167
K-S Test Statistic	0.159674
K-S 5% Critical Value	0.165408
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	993.2412
Adjusted Gamma UCL	1018.147

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.894344
Shapiro-Wilk 5% Critical Value	0.929
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4323.07
95% Chebyshev (MVUE) UCL	3331.674
97.5% Chebyshev (MVUE) UCL	4279.121
99% Chebyshev (MVUE) UCL	6140.197

95% Non-parametric UCLs	
CLT UCL	919.0588
Adj-CLT UCL (Adjusted for skewness)	1007.56
Mod-t UCL (Adjusted for skewness)	941.6821
Jackknife UCL	927.8776
Standard Bootstrap UCL	915.2538
Bootstrap-t UCL	1147.189
Hall's Bootstrap UCL	1141.62
Percentile Bootstrap UCL	932.0597
BCA Bootstrap UCL	1120.029
95% Chebyshev (Mean, Sd) UCL	1375.767
97.5% Chebyshev (Mean, Sd) UCL	1693.153
99% Chebyshev (Mean, Sd) UCL	2316.595

Data File

Variable: Lead (mg/kg dry)

Raw Statistics	
Number of Valid Samples	32
Number of Unique Samples	32
Minimum	0.52
Maximum	47600
Mean	2109.698
Median	382
Standard Deviation	8352.044
Variance	69756644
Coefficient of Variation	3.958881
Skewness	5.550724

Gamma Statistics	
k hat	0.335993
k star (bias corrected)	0.325327
Theta hat	6278.995
Theta star	6484.855
nu hat	21.50355
nu star	20.82093
Approx.Chi Square Value (.05)	11.457
Adjusted Level of Significance	0.0416
Adjusted Chi Square Value	11.08471

Log-transformed Statistics	
Minimum of log data	-0.653926
Maximum of log data	10.77059
Mean of log data	5.639589
Standard Deviation of log data	2.039497
Variance of log data	4.159547

RECOMMENDATION

Data are lognormal (0.05)

Use 97.5% Chebyshev (MVUE) UCL

7717.936

USE MEAN FOR LEAD MODEL

Includes hot spot (47600)

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.247191
Shapiro-Wilk 5% Critical Value	0.93
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4613.041

Gamma Distribution Test	
A-D Test Statistic	2.901112
A-D 5% Critical Value	0.846856
K-S Test Statistic	0.284194
K-S 5% Critical Value	0.16792
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3833.979
Adjusted Gamma UCL	3962.746

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.932686
Shapiro-Wilk 5% Critical Value	0.93
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	9250.908
95% Chebyshev (MVUE) UCL	5959.368
97.5% Chebyshev (MVUE) UCL	7717.936
99% Chebyshev (MVUE) UCL	11172.3

95% Non-parametric UCLs	
CLT UCL	4538.237
Adj-CLT UCL (Adjusted for skewness)	6086.244
Mod-t UCL (Adjusted for skewness)	4854.499
Jackknife UCL	4613.041
Standard Bootstrap UCL	4427.441
Bootstrap-t UCL	24306.03
Hall's Bootstrap UCL	14846.4
Percentile Bootstrap UCL	4997.516
BCA Bootstrap UCL	6720.962
95% Chebyshev (Mean, Sd) UCL	8545.381
97.5% Chebyshev (Mean, Sd) UCL	11330.11
99% Chebyshev (Mean, Sd) UCL	16800.16

Data File

Variable: Manganese (mg/kg dry)

Raw Statistics	
Number of Valid Samples	32
Number of Unique Samples	32
Minimum	3.19
Maximum	3090
Mean	362.227813
Median	229
Standard Deviation	544.210539
Variance	296165.111
Coefficient of Variation	1.50239855
Skewness	4.34007145

Gamma Statistics	
k hat	0.90108324
k star (bias corrected)	0.83744002
Theta hat	401.99151
Theta star	432.541799
nu hat	57.6693273
nu star	53.5961612
Approx.Chi Square Value (.05)	37.7737957
Adjusted Level of Significance	0.0416
Adjusted Chi Square Value	37.0620256

Log-transformed Statistics	
Minimum of log data	1.16002092
Maximum of log data	8.03592637
Mean of log data	5.24358472
Standard Deviation of log data	1.3422661
Variance of log data	1.80167828

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

513.9547

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.519418
Shapiro-Wilk 5% Critical Value	0.93
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	525.343

Gamma Distribution Test	
A-D Test Statistic	0.82483
A-D 5% Critical Value	0.780386
K-S Test Statistic	0.123938
K-S 5% Critical Value	0.160678
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	513.9547
Adjusted Gamma UCL	523.8251

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.882024
Shapiro-Wilk 5% Critical Value	0.93
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	926.7728
95% Chebyshev (MVUE) UCL	1010.26
97.5% Chebyshev (MVUE) UCL	1255.515
99% Chebyshev (MVUE) UCL	1737.271

95% Non-parametric UCLs	
CLT UCL	520.4689
Adj-CLT UCL (Adjusted for skewness)	599.3357
Mod-t UCL (Adjusted for skewness)	537.6447
Jackknife UCL	525.343
Standard Bootstrap UCL	519.4655
Bootstrap-t UCL	754.7078
Hall's Bootstrap UCL	1141.814
Percentile Bootstrap UCL	535.2309
BCA Bootstrap UCL	668.8091
95% Chebyshev (Mean, Sd) UCL	781.5702
97.5% Chebyshev (Mean, Sd) UCL	963.02
99% Chebyshev (Mean, Sd) UCL	1319.443

Data File

Variable: Mercury (mg/kg dry) without outlier

Raw Statistics	
Number of Valid Samples	39
Number of Unique Samples	39
Minimum	0.331
Maximum	588
Mean	113.4725
Median	27.5
Standard Deviation	173.2872
Variance	30028.45
Coefficient of Variation	1.527129
Skewness	1.702778

Gamma Statistics	
k hat	0.454807
k star (bias corrected)	0.436916
Theta hat	249.4958
Theta star	259.7124
nu hat	35.47496
nu star	34.07945
Approx.Chi Square Value (.05)	21.72572
Adjusted Level of Significance	0.0437
Adjusted Chi Square Value	21.33573

Log-transformed Statistics	
Minimum of log data	-1.105637
Maximum of log data	6.376727
Mean of log data	3.314084
Standard Deviation of log data	2.006274
Variance of log data	4.025134

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Adjusted Gamma UCL

181.2491

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.665323
Shapiro-Wilk 5% Critical Value	0.939
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	160.2546

Gamma Distribution Test	
A-D Test Statistic	0.9055
A-D 5% Critical Value	0.822997
K-S Test Statistic	0.134765
K-S 5% Critical Value	0.150366
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	177.9955
Adjusted Gamma UCL	181.2491

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.954823
Shapiro-Wilk 5% Critical Value	0.939
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	688.1097
95% Chebyshev (MVUE) UCL	532.8435
97.5% Chebyshev (MVUE) UCL	685.8122
99% Chebyshev (MVUE) UCL	986.2896

95% Non-parametric UCLs	
CLT UCL	159.1142
Adj-CLT UCL (Adjusted for skewness)	167.1984
Mod-t UCL (Adjusted for skewness)	161.5156
Jackknife UCL	160.2546
Standard Bootstrap UCL	157.3589
Bootstrap-t UCL	171.0103
Hall's Bootstrap UCL	161.4947
Percentile Bootstrap UCL	160.8317
BCA Bootstrap UCL	181.6769
95% Chebyshev (Mean, Sd) UCL	234.4239
97.5% Chebyshev (Mean, Sd) UCL	286.7597
99% Chebyshev (Mean, Sd) UCL	389.5632

Data File

Variable: Mercury (mg/kg dry)

Raw Statistics	
Number of Valid Samples	40
Number of Unique Samples	40
Minimum	0.331
Maximum	295000
Mean	7485.636
Median	29
Standard Deviation	46625.97
Variance	2.17E+09
Coefficient of Variation	6.228725
Skewness	6.324421

Gamma Statistics	
k hat	0.143866
k star (bias corrected)	0.149743
Theta hat	52031.92
Theta star	49989.91
nu hat	11.5093
nu star	11.97943
Approx.Chi Square Value (.05)	5.212482
Adjusted Level of Significance	0.044
Adjusted Chi Square Value	5.045196

Log-transformed Statistics	
Minimum of log data	-1.105637
Maximum of log data	12.59473
Mean of log data	3.5461
Standard Deviation of log data	2.464789
Variance of log data	6.075186

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

80838.23

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.1632844
Shapiro-Wilk 5% Critical Value	0.94
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	19906.891

Gamma Distribution Test	
A-D Test Statistic	8.5711362
A-D 5% Critical Value	0.936325
K-S Test Statistic	0.4146796
K-S 5% Critical Value	0.1564801
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	17203.645
Adjusted Gamma UCL	17774.072

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.9338421
Shapiro-Wilk 5% Critical Value	0.94
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4062.401
95% Chebyshev (MVUE) UCL	1957.3573
97.5% Chebyshev (MVUE) UCL	2562.5898
99% Chebyshev (MVUE) UCL	3751.4519

95% Non-parametric UCLs	
CLT UCL	19611.847
Adj-CLT UCL (Adjusted for skewness)	27488.996
Mod-t UCL (Adjusted for skewness)	21135.567
Jackknife UCL	19906.891
Standard Bootstrap UCL	19437.482
Bootstrap-t UCL	2449453.7
Hall's Bootstrap UCL	1228300
Percentile Bootstrap UCL	22227.005
BCA Bootstrap UCL	29638.221
95% Chebyshev (Mean, Sd) UCL	39620.366
97.5% Chebyshev (Mean, Sd) UCL	53525.09
99% Chebyshev (Mean, Sd) UCL	80838.227

Data File

Variable: Methyl mercury (ng/g dry)

Raw Statistics	
Number of Valid Samples	9
Number of Unique Samples	9
Minimum	0.59
Maximum	322
Mean	40.061111
Median	4.32
Standard Deviation	105.84313
Variance	11202.768
Coefficient of Variation	2.6420418
Skewness	2.9875638

Gamma Statistics	
k hat	0.3316
k star (bias corrected)	0.2951407
Theta hat	120.81156
Theta star	135.73562
nu hat	5.9687997
nu star	5.3125331
Approx.Chi Square Value (.05)	1.298827
Adjusted Level of Significance	0.02308
Adjusted Chi Square Value	0.9297842

Log-transformed Statistics	
Minimum of log data	-0.527633
Maximum of log data	5.7745515
Mean of log data	1.6446158
Standard Deviation of log data	1.8210492
Variance of log data	3.3162203

RECOMMENDATION

Data are lognormal (0.05)

Use 99% Chebyshev (MVUE) UCL

136.2529

N<10, used detected max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.425609
Shapiro-Wilk 5% Critical Value	0.829
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	105.6679

Gamma Distribution Test	
A-D Test Statistic	1.439401
A-D 5% Critical Value	0.801499
K-S Test Statistic	0.370232
K-S 5% Critical Value	0.300294
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	163.8601
Adjusted Gamma UCL	228.8983

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.869781
Shapiro-Wilk 5% Critical Value	0.829
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	863.0386
95% Chebyshev (MVUE) UCL	70.44991
97.5% Chebyshev (MVUE) UCL	92.64834
99% Chebyshev (MVUE) UCL	136.2529

95% Non-parametric UCLs	
CLT UCL	98.09326
Adj-CLT UCL (Adjusted for skewness)	135.6353
Mod-t UCL (Adjusted for skewness)	111.5237
Jackknife UCL	105.6679
Standard Bootstrap UCL	95.42031
Bootstrap-t UCL	2266.433
Hall's Bootstrap UCL	752.58
Percentile Bootstrap UCL	109.9833
BCA Bootstrap UCL	147.1022
95% Chebyshev (Mean, Sd) UCL	193.8476
97.5% Chebyshev (Mean, Sd) UCL	260.3912
99% Chebyshev (Mean, Sd) UCL	391.1031

Data File

Variable: Nickel (mg/kg dry)

Raw Statistics	
Number of Valid Samples	33
Number of Unique Samples	33
Minimum	0.256
Maximum	193
Mean	36.22255
Median	30.1
Standard Deviation	35.79141
Variance	1281.025
Coefficient of Variation	0.988098
Skewness	2.761106

Gamma Statistics	
k hat	1.033672
k star (bias corrected)	0.959904
Theta hat	35.04258
Theta star	37.73558
nu hat	68.22238
nu star	63.35368
Approx.Chi Square Value (.05)	46.0399
Adjusted Level of Significance	0.0419
Adjusted Chi Square Value	45.27945

Log-transformed Statistics	
Minimum of log data	-1.362578
Maximum of log data	5.26269
Mean of log data	3.033414
Standard Deviation of log data	1.375583
Variance of log data	1.892229

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

49.84441

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.759292
Shapiro-Wilk 5% Critical Value	0.931
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	46.77629

Gamma Distribution Test	
A-D Test Statistic	0.471328
A-D 5% Critical Value	0.774908
K-S Test Statistic	0.119255
K-S 5% Critical Value	0.157608
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	49.84441
Adjusted Gamma UCL	50.68152

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.860865
Shapiro-Wilk 5% Critical Value	0.931
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	107.9353
95% Chebyshev (MVUE) UCL	116.8991
97.5% Chebyshev (MVUE) UCL	145.5058
99% Chebyshev (MVUE) UCL	201.698

95% Non-parametric UCLs	
CLT UCL	46.47078
Adj-CLT UCL (Adjusted for skewness)	49.67062
Mod-t UCL (Adjusted for skewness)	47.2754
Jackknife UCL	46.77629
Standard Bootstrap UCL	46.49828
Bootstrap-t UCL	52.54483
Hall's Bootstrap UCL	95.89234
Percentile Bootstrap UCL	47.632
BCA Bootstrap UCL	54.60321
95% Chebyshev (Mean, Sd) UCL	63.3806
97.5% Chebyshev (Mean, Sd) UCL	75.13191
99% Chebyshev (Mean, Sd) UCL	98.21509

Data File

Variable: Silver (mg/kg dry)

Raw Statistics	
Number of Valid Samples	33
Number of Unique Samples	31
Minimum	0.0273
Maximum	93.8
Mean	6.812673
Median	1.6
Standard Deviation	17.258
Variance	297.8385
Coefficient of Variation	2.53322
Skewness	4.405676

Gamma Statistics	
k hat	0.403738
k star (bias corrected)	0.387237
Theta hat	16.87398
Theta star	17.59303
nu hat	26.64673
nu star	25.55764
Approx.Chi Square Value (.05)	15.03737
Adjusted Level of Significance	0.0419
Adjusted Chi Square Value	14.62116

Log-transformed Statistics	
Minimum of log data	-3.600869
Maximum of log data	4.541165
Mean of log data	0.291363
Standard Deviation of log data	1.92402
Variance of log data	3.701855

RECOMMENDATION

Data are lognormal (0.05)

Use 95% Chebyshev (MVUE) UCL

22.06622

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.41661
Shapiro-Wilk 5% Critical Value	0.931
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	11.90151

Gamma Distribution Test	
A-D Test Statistic	1.307991
A-D 5% Critical Value	0.832367
K-S Test Statistic	0.177558
K-S 5% Critical Value	0.164018
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	11.57887
Adjusted Gamma UCL	11.90849

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.98246
Shapiro-Wilk 5% Critical Value	0.931
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	29.68021
95% Chebyshev (MVUE) UCL	22.06622
97.5% Chebyshev (MVUE) UCL	28.41008
99% Chebyshev (MVUE) UCL	40.87137

95% Non-parametric UCLs	
CLT UCL	11.75419
Adj-CLT UCL (Adjusted for skewness)	14.21609
Mod-t UCL (Adjusted for skewness)	12.28551
Jackknife UCL	11.90151
Standard Bootstrap UCL	11.68666
Bootstrap-t UCL	26.03639
Hall's Bootstrap UCL	25.35441
Percentile Bootstrap UCL	12.08341
BCA Bootstrap UCL	16.31955
95% Chebyshev (Mean, Sd) UCL	19.90782
97.5% Chebyshev (Mean, Sd) UCL	25.57409
99% Chebyshev (Mean, Sd) UCL	36.7044

Data File

Variable: Thallium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	33
Number of Unique Samples	26
Minimum	0.208
Maximum	21.9
Mean	2.091788
Median	0.5
Standard Deviation	4.646517
Variance	21.59012
Coefficient of Variation	2.221314
Skewness	3.355605

Gamma Statistics	
k hat	0.614715
k star (bias corrected)	0.579034
Theta hat	3.402858
Theta star	3.612549
nu hat	40.57119
nu star	38.21623
Approx.Chi Square Value (.05)	25.05689
Adjusted Level of Significance	0.0419
Adjusted Chi Square Value	24.5074

Log-transformed Statistics	
Minimum of log data	-1.570217
Maximum of log data	3.086487
Mean of log data	-0.263551
Standard Deviation of log data	1.117643
Variance of log data	1.249125

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

10.13979

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.43127
Shapiro-Wilk 5% Critical Value	0.931
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3.461898

Gamma Distribution Test	
A-D Test Statistic	5.716005
A-D 5% Critical Value	0.800322
K-S Test Statistic	0.361319
K-S 5% Critical Value	0.160712
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3.19035
Adjusted Gamma UCL	3.261882

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.746325
Shapiro-Wilk 5% Critical Value	0.931
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.375386
95% Chebyshev (MVUE) UCL	2.792616
97.5% Chebyshev (MVUE) UCL	3.398054
99% Chebyshev (MVUE) UCL	4.587318

95% Non-parametric UCLs	
CLT UCL	3.422236
Adj-CLT UCL (Adjusted for skewness)	3.927089
Mod-t UCL (Adjusted for skewness)	3.540645
Jackknife UCL	3.461898
Standard Bootstrap UCL	3.384314
Bootstrap-t UCL	5.501377
Hall's Bootstrap UCL	3.762728
Percentile Bootstrap UCL	3.548242
BCA Bootstrap UCL	4.235121
95% Chebyshev (Mean, Sd) UCL	5.617504
97.5% Chebyshev (Mean, Sd) UCL	7.143085
99% Chebyshev (Mean, Sd) UCL	10.13979

Data File

Variable: Vanadium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	32
Number of Unique Samples	31
Minimum	0.054
Maximum	245
Mean	46.13534
Median	26.5
Standard Deviation	55.04284
Variance	3029.714
Coefficient of Variation	1.193073
Skewness	2.280179

Gamma Statistics	
k hat	0.722201
k star (bias corrected)	0.675328
Theta hat	63.8816
Theta star	68.31548
nu hat	46.22085
nu star	43.22098
Approx.Chi Square Value (.05)	29.14387
Adjusted Level of Significance	0.0416
Adjusted Chi Square Value	28.52424

Log-transformed Statistics	
Minimum of log data	-2.918771
Maximum of log data	5.501258
Mean of log data	2.998386
Standard Deviation of log data	1.809986
Variance of log data	3.276048

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

68.4197

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.719812
Shapiro-Wilk 5% Critical Value	0.93
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	62.63323

Gamma Distribution Test	
A-D Test Statistic	0.686716
A-D 5% Critical Value	0.790263
K-S Test Statistic	0.139489
K-S 5% Critical Value	0.161902
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	68.4197
Adjusted Gamma UCL	69.90599

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.827959
Shapiro-Wilk 5% Critical Value	0.93
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	323.2776
95% Chebyshev (MVUE) UCL	261.5231
97.5% Chebyshev (MVUE) UCL	335.071
99% Chebyshev (MVUE) UCL	479.5415

95% Non-parametric UCLs	
CLT UCL	62.14025
Adj-CLT UCL (Adjusted for skewness)	66.33108
Mod-t UCL (Adjusted for skewness)	63.28692
Jackknife UCL	62.63323
Standard Bootstrap UCL	61.96477
Bootstrap-t UCL	71.60816
Hall's Bootstrap UCL	69.43191
Percentile Bootstrap UCL	62.66659
BCA Bootstrap UCL	71.89063
95% Chebyshev (Mean, Sd) UCL	88.5487
97.5% Chebyshev (Mean, Sd) UCL	106.901
99% Chebyshev (Mean, Sd) UCL	142.9505

Data File

Variable: Zinc (mg/kg dry)

Raw Statistics	
Number of Valid Samples	33
Number of Unique Samples	33
Minimum	3.93
Maximum	188000
Mean	8271.358
Median	512
Standard Deviation	32696.59
Variance	1.07E+09
Coefficient of Variation	3.95299
Skewness	5.5186

Gamma Statistics	
k hat	0.277385
k star (bias corrected)	0.27237
Theta hat	29819.05
Theta star	30368.07
nu hat	18.30741
nu star	17.97643
Approx.Chi Square Value (.05)	9.37246
Adjusted Level of Significance	0.0419
Adjusted Chi Square Value	9.052302

Log-transformed Statistics	
Minimum of log data	1.368639
Maximum of log data	12.1442
Mean of log data	6.502652
Standard Deviation of log data	2.160861
Variance of log data	4.669319

RECOMMENDATION

Data are lognormal (0.05)

Use 97.5% Chebyshev (MVUE) UCL
23984.96

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.265273
Shapiro-Wilk 5% Critical Value	0.931
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	17912.54

Gamma Distribution Test	
A-D Test Statistic	3.112915
A-D 5% Critical Value	0.865199
K-S Test Statistic	0.290957
K-S 5% Critical Value	0.167018
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15864.51
Adjusted Gamma UCL	16425.6

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.9779
Shapiro-Wilk 5% Critical Value	0.931
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	32071.03
95% Chebyshev (MVUE) UCL	18442.61
97.5% Chebyshev (MVUE) UCL	23984.96
99% Chebyshev (MVUE) UCL	34871.84

95% Non-parametric UCLs	
CLT UCL	17633.45
Adj-CLT UCL (Adjusted for skewness)	23475.94
Mod-t UCL (Adjusted for skewness)	18823.85
Jackknife UCL	17912.54
Standard Bootstrap UCL	17352.1
Bootstrap-t UCL	74050.32
Hall's Bootstrap UCL	50323.36
Percentile Bootstrap UCL	19025.84
BCA Bootstrap UCL	26546.21
95% Chebyshev (Mean, Sd) UCL	33081.11
97.5% Chebyshev (Mean, Sd) UCL	43816.3
99% Chebyshev (Mean, Sd) UCL	64903.52

Data File

Variable: bis[2-Ethylhexyl]phthalate (µg/kg dry)

Raw Statistics	
Number of Valid Samples	28
Number of Unique Samples	24
Minimum	40
Maximum	380000
Mean	25896.25
Median	470
Standard Deviation	88274.03
Variance	7.79E+09
Coefficient of Variation	3.408757
Skewness	3.620752

Gamma Statistics	
k hat	0.214183
k star (bias corrected)	0.215044
Theta hat	120907.1
Theta star	120422.8
nu hat	11.99425
nu star	12.04249
Approx.Chi Square Value (.05)	5.254019
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	4.97817

Log-transformed Statistics	
Minimum of log data	3.688879
Maximum of log data	12.84793
Mean of log data	6.762664
Standard Deviation of log data	2.289055
Variance of log data	5.239772

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

191882.3

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.324559
Shapiro-Wilk 5% Critical Value	0.924
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	54310.88

Gamma Distribution Test	
A-D Test Statistic	4.355901
A-D 5% Critical Value	0.890998
K-S Test Statistic	0.346716
K-S 5% Critical Value	0.182694
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	59355.58
Adjusted Gamma UCL	62644.57

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.887562
Shapiro-Wilk 5% Critical Value	0.924
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	81501.94
95% Chebyshev (MVUE) UCL	31890.53
97.5% Chebyshev (MVUE) UCL	41790.35
99% Chebyshev (MVUE) UCL	61236.64

95% Non-parametric UCLs	
CLT UCL	53336.07
Adj-CLT UCL (Adjusted for skewness)	65533.1
Mod-t UCL (Adjusted for skewness)	56213.38
Jackknife UCL	54310.88
Standard Bootstrap UCL	52810.6
Bootstrap-t UCL	522984.2
Hall's Bootstrap UCL	525893.1
Percentile Bootstrap UCL	55060.54
BCA Bootstrap UCL	74185.54
95% Chebyshev (Mean, Sd) UCL	98612.38
97.5% Chebyshev (Mean, Sd) UCL	130076.7
99% Chebyshev (Mean, Sd) UCL	191882.3

Data File

Variable: Benz[a]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	25
Minimum	78
Maximum	11500
Mean	1258.815
Median	440
Standard Deviation	2308.623
Variance	5329738
Coefficient of Variation	1.833965
Skewness	3.696353

Gamma Statistics	
k hat	0.672784
k star (bias corrected)	0.622721
Theta hat	1871.055
Theta star	2021.474
nu hat	36.33031
nu star	33.62695
Approx.Chi Square Value (.05)	21.36427
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	20.73881

Log-transformed Statistics	
Minimum of log data	4.356709
Maximum of log data	9.350102
Mean of log data	6.234628
Standard Deviation of log data	1.287875
Variance of log data	1.658623

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

2409.866

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.526864
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2016.612

Gamma Distribution Test	
A-D Test Statistic	1.309969
A-D 5% Critical Value	0.791176
K-S Test Statistic	0.187045
K-S 5% Critical Value	0.175872
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1981.35
Adjusted Gamma UCL	2041.105

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.952917
Shapiro-Wilk 5% Critical Value	0.923
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2409.866
95% Chebyshev (MVUE) UCL	2553.649
97.5% Chebyshev (MVUE) UCL	3178.409
99% Chebyshev (MVUE) UCL	4405.627

95% Non-parametric UCLs	
CLT UCL	1989.614
Adj-CLT UCL (Adjusted for skewness)	2327.324
Mod-t UCL (Adjusted for skewness)	2069.287
Jackknife UCL	2016.612
Standard Bootstrap UCL	1981.608
Bootstrap-t UCL	3056.261
Hall's Bootstrap UCL	4543.903
Percentile Bootstrap UCL	2074.667
BCA Bootstrap UCL	2644.815
95% Chebyshev (Mean, Sd) UCL	3195.45
97.5% Chebyshev (Mean, Sd) UCL	4033.434
99% Chebyshev (Mean, Sd) UCL	5679.49

Data File

Variable: Benzo[a]pyrene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	28
Number of Unique Samples	26
Minimum	73
Maximum	11500
Mean	1468.78571
Median	450
Standard Deviation	2767.61494
Variance	7659692.47
Coefficient of Variation	1.88428776
Skewness	3.03725738

Gamma Statistics	
k hat	0.61893379
k star (bias corrected)	0.57642898
Theta hat	2373.09021
Theta star	2548.07751
nu hat	34.6602922
nu star	32.2800228
Approx.Chi Square Value (.05)	20.2921205
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	19.7038449

Log-transformed Statistics	
Minimum of log data	4.29045944
Maximum of log data	9.35010231
Mean of log data	6.29844252
Standard Deviation of log data	1.34034576
Variance of log data	1.79652675

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

2833.715

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.51788
Shapiro-Wilk 5% Critical Value	0.924
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2359.657

Gamma Distribution Test	
A-D Test Statistic	1.600729
A-D 5% Critical Value	0.798086
K-S Test Statistic	0.195707
K-S 5% Critical Value	0.173479
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2336.495
Adjusted Gamma UCL	2406.253

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.951403
Shapiro-Wilk 5% Critical Value	0.924
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2833.715
95% Chebyshev (MVUE) UCL	2961.483
97.5% Chebyshev (MVUE) UCL	3696.821
99% Chebyshev (MVUE) UCL	5141.248

95% Non-parametric UCLs	
CLT UCL	2329.094
Adj-CLT UCL (Adjusted for skewness)	2649.875
Mod-t UCL (Adjusted for skewness)	2409.692
Jackknife UCL	2359.657
Standard Bootstrap UCL	2311.011
Bootstrap-t UCL	3968.36
Hall's Bootstrap UCL	6007.416
Percentile Bootstrap UCL	2362.25
BCA Bootstrap UCL	3127.25
95% Chebyshev (Mean, Sd) UCL	3748.621
97.5% Chebyshev (Mean, Sd) UCL	4735.107
99% Chebyshev (Mean, Sd) UCL	6672.869

Data File

Variable: Benzo[b]fluoranthene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	28
Number of Unique Samples	22
Minimum	100
Maximum	13000
Mean	1725.714
Median	650
Standard Deviation	3133.206
Variance	9816981
Coefficient of Variation	1.8156
Skewness	3.035239

Gamma Statistics	
k hat	0.666882
k star (bias corrected)	0.61924
Theta hat	2587.734
Theta star	2786.825
nu hat	37.34542
nu star	34.67746
Approx.Chi Square Value (.05)	22.20432
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	21.58657

Log-transformed Statistics	
Minimum of log data	4.60517
Maximum of log data	9.472705
Mean of log data	6.540964
Standard Deviation of log data	1.284791
Variance of log data	1.650687

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

3192.777

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.522741
Shapiro-Wilk 5% Critical Value	0.924
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2734.266

Gamma Distribution Test	
A-D Test Statistic	1.515783
A-D 5% Critical Value	0.793175
K-S Test Statistic	0.193577
K-S 5% Critical Value	0.172891
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2695.123
Adjusted Gamma UCL	2772.251

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.951278
Shapiro-Wilk 5% Critical Value	0.924
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3192.777
95% Chebyshev (MVUE) UCL	3428.087
97.5% Chebyshev (MVUE) UCL	4260.33
99% Chebyshev (MVUE) UCL	5895.11

95% Non-parametric UCLs	
CLT UCL	2699.666
Adj-CLT UCL (Adjusted for skewness)	3062.58
Mod-t UCL (Adjusted for skewness)	2790.873
Jackknife UCL	2734.266
Standard Bootstrap UCL	2707.832
Bootstrap-t UCL	4719.147
Hall's Bootstrap UCL	6987.083
Percentile Bootstrap UCL	2799.643
BCA Bootstrap UCL	3506.071
95% Chebyshev (Mean, Sd) UCL	4306.707
97.5% Chebyshev (Mean, Sd) UCL	5423.504
99% Chebyshev (Mean, Sd) UCL	7617.237

Data File

Variable: Dibenz[a,h]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	19
Minimum	44
Maximum	11500
Mean	756.4444
Median	190
Standard Deviation	2251.195
Variance	5067881
Coefficient of Variation	2.976022
Skewness	4.58031

Gamma Statistics	
k hat	0.501903
k star (bias corrected)	0.470827
Theta hat	1507.154
Theta star	1606.629
nu hat	27.10274
nu star	25.42466
Approx.Chi Square Value (.05)	14.93529
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	14.42102

Log-transformed Statistics	
Minimum of log data	3.78419
Maximum of log data	9.350102
Mean of log data	5.363827
Standard Deviation of log data	1.213839
Variance of log data	1.473406

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

5067.156

Recommended UCL exceeds the detected max (900), use max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.3255394
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1495.391

Gamma Distribution Test	
A-D Test Statistic	4.1737065
A-D 5% Critical Value	0.8072115
K-S Test Statistic	0.3746806
K-S 5% Critical Value	0.1778678
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1287.7112
Adjusted Gamma UCL	1333.6326

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.8334948
Shapiro-Wilk 5% Critical Value	0.923
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	860.67765
95% Chebyshev (MVUE) UCL	943.35755
97.5% Chebyshev (MVUE) UCL	1166.8722
99% Chebyshev (MVUE) UCL	1605.9234

95% Non-parametric UCLs	
CLT UCL	1469.0654
Adj-CLT UCL (Adjusted for skewness)	1877.1261
Mod-t UCL (Adjusted for skewness)	1559.0402
Jackknife UCL	1495.391
Standard Bootstrap UCL	1454.2111
Bootstrap-t UCL	7791.0156
Hall's Bootstrap UCL	5443.8104
Percentile Bootstrap UCL	1553.6296
BCA Bootstrap UCL	2176.0741
95% Chebyshev (Mean, Sd) UCL	2644.9059
97.5% Chebyshev (Mean, Sd) UCL	3462.0447
99% Chebyshev (Mean, Sd) UCL	5067.1556

Data File

Variable: Indeno[1,2,3-cd]pyrene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	25
Minimum	57
Maximum	11500
Mean	1030.2593
Median	270
Standard Deviation	2253.6306
Variance	5078851
Coefficient of Variation	2.1874403
Skewness	4.2062683

Gamma Statistics	
k hat	0.6207645
k star (bias corrected)	0.5764821
Theta hat	1659.6619
Theta star	1787.1489
nu hat	33.521285
nu star	31.130031
Approx.Chi Square Value (.05)	19.381357
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	18.788181

Log-transformed Statistics	
Minimum of log data	4.0430513
Maximum of log data	9.3501023
Mean of log data	5.9471748
Standard Deviation of log data	1.2658576
Variance of log data	1.6023955

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

1722.915

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.441186
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1770.005

Gamma Distribution Test	
A-D Test Statistic	1.897183
A-D 5% Critical Value	0.796057
K-S Test Statistic	0.199296
K-S 5% Critical Value	0.176479
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1654.786
Adjusted Gamma UCL	1707.031

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.936572
Shapiro-Wilk 5% Critical Value	0.923
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1722.915
95% Chebyshev (MVUE) UCL	1845.062
97.5% Chebyshev (MVUE) UCL	2292.323
99% Chebyshev (MVUE) UCL	3170.88

95% Non-parametric UCLs	
CLT UCL	1743.651
Adj-CLT UCL (Adjusted for skewness)	2118.794
Mod-t UCL (Adjusted for skewness)	1828.52
Jackknife UCL	1770.005
Standard Bootstrap UCL	1725.485
Bootstrap-t UCL	3227.085
Hall's Bootstrap UCL	4104.952
Percentile Bootstrap UCL	1799.889
BCA Bootstrap UCL	2406.815
95% Chebyshev (Mean, Sd) UCL	2920.764
97.5% Chebyshev (Mean, Sd) UCL	3738.786
99% Chebyshev (Mean, Sd) UCL	5345.633

Data File

Variable: Naphthalene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	19
Minimum	62
Maximum	120000
Mean	4911.185
Median	220
Standard Deviation	23013.53
Variance	5.3E+08
Coefficient of Variation	4.685942
Skewness	5.18692

Gamma Statistics	
k hat	0.265395
k star (bias corrected)	0.260598
Theta hat	18505.2
Theta star	18845.83
nu hat	14.33132
nu star	14.07229
Approx.Chi Square Value (.05)	6.619725
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	6.293971

Log-transformed Statistics	
Minimum of log data	4.127134
Maximum of log data	11.69525
Mean of log data	5.84866
Standard Deviation of log data	1.473656
Variance of log data	2.171662

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

48978.74

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.214844
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	12465.29

Gamma Distribution Test	
A-D Test Statistic	6.755322
A-D 5% Critical Value	0.867819
K-S Test Statistic	0.400024
K-S 5% Critical Value	0.183956
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	10440.25
Adjusted Gamma UCL	10980.61

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.710824
Shapiro-Wilk 5% Critical Value	0.923
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2538.959
95% Chebyshev (MVUE) UCL	2412.33
97.5% Chebyshev (MVUE) UCL	3044.259
99% Chebyshev (MVUE) UCL	4285.559

95% Non-parametric UCLs	
CLT UCL	12196.17
Adj-CLT UCL (Adjusted for skewness)	16920.16
Mod-t UCL (Adjusted for skewness)	13202.14
Jackknife UCL	12465.29
Standard Bootstrap UCL	11835.52
Bootstrap-t UCL	248056.2
Hall's Bootstrap UCL	208652.5
Percentile Bootstrap UCL	13725.63
BCA Bootstrap UCL	18318.52
95% Chebyshev (Mean, Sd) UCL	24216.56
97.5% Chebyshev (Mean, Sd) UCL	32570.01
99% Chebyshev (Mean, Sd) UCL	48978.74

Data File

Variable: 2-Methylnaphthalene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	28
Number of Unique Samples	19
Minimum	36
Maximum	15000
Mean	963.8929
Median	215
Standard Deviation	2854.283
Variance	8146931
Coefficient of Variation	2.961203
Skewness	4.760891

Gamma Statistics	
k hat	0.503169
k star (bias corrected)	0.473067
Theta hat	1915.645
Theta star	2037.538
nu hat	28.17745
nu star	26.49177
Approx.Chi Square Value (.05)	15.75672
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	15.24441

Log-transformed Statistics	
Minimum of log data	3.583519
Maximum of log data	9.615805
Mean of log data	5.609853
Standard Deviation of log data	1.239437
Variance of log data	1.536205

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

6330.942

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.327193
Shapiro-Wilk 5% Critical Value	0.924
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1882.661

Gamma Distribution Test	
A-D Test Statistic	4.398029
A-D 5% Critical Value	0.809945
K-S Test Statistic	0.357762
K-S 5% Critical Value	0.174901
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1620.592
Adjusted Gamma UCL	1675.056

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.831405
Shapiro-Wilk 5% Critical Value	0.924
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1142.083
95% Chebyshev (MVUE) UCL	1250.881
97.5% Chebyshev (MVUE) UCL	1548.665
99% Chebyshev (MVUE) UCL	2133.604

95% Non-parametric UCLs	
CLT UCL	1851.141
Adj-CLT UCL (Adjusted for skewness)	2369.712
Mod-t UCL (Adjusted for skewness)	1963.548
Jackknife UCL	1882.661
Standard Bootstrap UCL	1858.777
Bootstrap-t UCL	5643.412
Hall's Bootstrap UCL	5363.336
Percentile Bootstrap UCL	1965.393
BCA Bootstrap UCL	2917.571
95% Chebyshev (Mean, Sd) UCL	3315.121
97.5% Chebyshev (Mean, Sd) UCL	4332.499
99% Chebyshev (Mean, Sd) UCL	6330.942

Data File

Variable: Aroclor® 1248 (µg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	3
Minimum	34
Maximum	4400
Mean	1292
Median	367
Standard Deviation	2095.651
Variance	4391752
Coefficient of Variation	1.622021
Skewness	1.871231

Gamma Statistics	
k hat	0.395744
k star (bias corrected)	0.265603
Theta hat	3264.738
Theta star	4864.41
nu hat	3.165951
nu star	2.124821
Approx.Chi Square Value (.05)	0.168682
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	3.526361
Maximum of log data	8.38936
Mean of log data	5.49829
Standard Deviation of log data	2.397475
Variance of log data	5.747888

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Adjusted Gamma UCL not available tı
16274.84

N<10, used detected max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.735057
Shapiro-Wilk 5% Critical Value	0.748
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3757.914

Gamma Distribution Test	
A-D Test Statistic	0.420153
A-D 5% Critical Value	0.693014
K-S Test Statistic	0.315482
K-S 5% Critical Value	0.414331
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	16274.84
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.859189
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.66E+16
95% Chebyshev (MVUE) UCL	5755.094
97.5% Chebyshev (MVUE) UCL	7709.928
99% Chebyshev (MVUE) UCL	11549.82

95% Non-parametric UCLs	
CLT UCL	3015.519
Adj-CLT UCL (Adjusted for skewness)	4063.05
Mod-t UCL (Adjusted for skewness)	3921.307
Jackknife UCL	3757.914
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	5859.365
97.5% Chebyshev (Mean, Sd) UCL	7835.667
99% Chebyshev (Mean, Sd) UCL	11717.73

Appendix E-4

Output for Undeveloped Area Sediments

Data File

Variable: Arsenic (mg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	2.6
Maximum	8.8
Mean	5
Median	4.9
Standard Deviation	2.354782
Variance	5.545
Coefficient of Variation	0.470956
Skewness	1.222308

Gamma Statistics	
k hat	6.149639
k star (bias corrected)	2.593189
Theta hat	0.813056
Theta star	1.928128
nu hat	61.49639
nu star	25.93189
Approx.Chi Square Value (.05)	15.3251
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	11.91236

Log-transformed Statistics	
Minimum of log data	0.955511
Maximum of log data	2.174752
Mean of log data	1.525935
Standard Deviation of log data	0.453059
Variance of log data	0.205263

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

7.245027

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.905885
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	7.245027

Gamma Distribution Test	
A-D Test Statistic	0.258788
A-D 5% Critical Value	0.680289
K-S Test Statistic	0.227025
K-S 5% Critical Value	0.358144
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	8.460591
Adjusted Gamma UCL	10.88445

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.974201
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	9.615224
95% Chebyshev (MVUE) UCL	9.36016
97.5% Chebyshev (MVUE) UCL	11.25219
99% Chebyshev (MVUE) UCL	14.96871

95% Non-parametric UCLs	
CLT UCL	6.73218
Adj-CLT UCL (Adjusted for skewness)	7.347274
Mod-t UCL (Adjusted for skewness)	7.340969
Jackknife UCL	7.245027
Standard Bootstrap UCL	6.580288
Bootstrap-t UCL	8.447048
Hall's Bootstrap UCL	14.76437
Percentile Bootstrap UCL	6.78
BCA Bootstrap UCL	7.28
95% Chebyshev (Mean, Sd) UCL	9.590316
97.5% Chebyshev (Mean, Sd) UCL	11.57655
99% Chebyshev (Mean, Sd) UCL	15.47812

Data File

Variable: Cadmium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	0.9
Maximum	9.1
Mean	3.7
Median	2.2
Standard Deviation	3.341407
Variance	11.165
Coefficient of Variation	0.903083
Skewness	1.383528

Gamma Statistics	
k hat	1.678514
k star (bias corrected)	0.804739
Theta hat	2.204331
Theta star	4.597764
nu hat	16.78514
nu star	8.047389
Approx.Chi Square Value (.05)	2.761808
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	1.599886

Log-transformed Statistics	
Minimum of log data	-0.105361
Maximum of log data	2.208274
Mean of log data	0.981787
Standard Deviation of log data	0.90906
Variance of log data	0.82639

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

6.885666

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.860101
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.885666

Gamma Distribution Test	
A-D Test Statistic	0.259626
A-D 5% Critical Value	0.685697
K-S Test Statistic	0.237188
K-S 5% Critical Value	0.361242
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	10.78111
Adjusted Gamma UCL	18.61092

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.977616
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	31.4295
95% Chebyshev (MVUE) UCL	9.913416
97.5% Chebyshev (MVUE) UCL	12.62174
99% Chebyshev (MVUE) UCL	17.94171

95% Non-parametric UCLs	
CLT UCL	6.157942
Adj-CLT UCL (Adjusted for skewness)	7.145875
Mod-t UCL (Adjusted for skewness)	7.039763
Jackknife UCL	6.885666
Standard Bootstrap UCL	5.932366
Bootstrap-t UCL	16.10967
Hall's Bootstrap UCL	22.45953
Percentile Bootstrap UCL	5.96
BCA Bootstrap UCL	6.84
95% Chebyshev (Mean, Sd) UCL	10.2136
97.5% Chebyshev (Mean, Sd) UCL	13.03204
99% Chebyshev (Mean, Sd) UCL	18.56832

Data File

Variable: Chromium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	55.4
Maximum	156
Mean	102.68
Median	88.4
Standard Deviation	46.66682
Variance	2177.792
Coefficient of Variation	0.454488
Skewness	0.348849

Gamma Statistics	
k hat	5.962278
k star (bias corrected)	2.518245
Theta hat	17.2216
Theta star	40.77443
nu hat	59.62278
nu star	25.18245
Approx.Chi Square Value (.05)	14.74957
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	11.41259

Log-transformed Statistics	
Minimum of log data	4.01458
Maximum of log data	5.049856
Mean of log data	4.545419
Standard Deviation of log data	0.467796
Variance of log data	0.218833

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

147.1717

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.863736
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	147.1717

Gamma Distribution Test	
A-D Test Statistic	0.402451
A-D 5% Critical Value	0.680358
K-S Test Statistic	0.260646
K-S 5% Critical Value	0.358171
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	175.3091
Adjusted Gamma UCL	226.5686

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.893511
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	204.5142
95% Chebyshev (MVUE) UCL	195.5982
97.5% Chebyshev (MVUE) UCL	235.7997
99% Chebyshev (MVUE) UCL	314.768

95% Non-parametric UCLs	
CLT UCL	137.0082
Adj-CLT UCL (Adjusted for skewness)	140.4872
Mod-t UCL (Adjusted for skewness)	147.7144
Jackknife UCL	147.1717
Standard Bootstrap UCL	133.3004
Bootstrap-t UCL	192.0056
Hall's Bootstrap UCL	172.2716
Percentile Bootstrap UCL	136.32
BCA Bootstrap UCL	140.88
95% Chebyshev (Mean, Sd) UCL	193.6504
97.5% Chebyshev (Mean, Sd) UCL	233.0133
99% Chebyshev (Mean, Sd) UCL	310.3342

Data File

Variable: Mercury (mg/kg dry)

Raw Statistics	
Number of Valid Samples	7
Number of Unique Samples	7
Minimum	18.95
Maximum	1290
Mean	685.7686
Median	856
Standard Deviation	600.0528
Variance	360063.4
Coefficient of Variation	0.875008
Skewness	-0.199007

Gamma Statistics	
k hat	0.652149
k star (bias corrected)	0.467895
Theta hat	1051.552
Theta star	1465.647
nu hat	9.130086
nu star	6.550526
Approx.Chi Square Value (.05)	1.926819
Adjusted Level of Significance	0.01584
Adjusted Chi Square Value	1.263448

Log-transformed Statistics	
Minimum of log data	2.941804
Maximum of log data	7.162397
Mean of log data	5.594513
Standard Deviation of log data	1.928155
Variance of log data	3.717782

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

1126.479

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.803544
Shapiro-Wilk 5% Critical Value	0.803
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1126.479

Gamma Distribution Test	
A-D Test Statistic	0.748482
A-D 5% Critical Value	0.742168
K-S Test Statistic	0.296221
K-S 5% Critical Value	0.324453
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2331.378
Adjusted Gamma UCL	3555.465

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.777173
Shapiro-Wilk 5% Critical Value	0.803
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	292288.2
95% Chebyshev (MVUE) UCL	4167.843
97.5% Chebyshev (MVUE) UCL	5515.287
99% Chebyshev (MVUE) UCL	8162.08

95% Non-parametric UCLs	
CLT UCL	1058.819
Adj-CLT UCL (Adjusted for skewness)	1040.591
Mod-t UCL (Adjusted for skewness)	1123.636
Jackknife UCL	1126.479
Standard Bootstrap UCL	1034.857
Bootstrap-t UCL	1103.96
Hall's Bootstrap UCL	933.6178
Percentile Bootstrap UCL	1042.976
BCA Bootstrap UCL	1146
95% Chebyshev (Mean, Sd) UCL	1674.361
97.5% Chebyshev (Mean, Sd) UCL	2102.126
99% Chebyshev (Mean, Sd) UCL	2942.387

Data File

Variable: Methyl mercury (ng/g dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	11.91
Maximum	126
Mean	63.388
Median	66.54
Standard Deviation	50.50414
Variance	2550.668
Coefficient of Variation	0.796746
Skewness	0.106423

Gamma Statistics	
k hat	1.400605
k star (bias corrected)	0.693575
Theta hat	45.25758
Theta star	91.39309
nu hat	14.00605
nu star	6.935754
Approx.Chi Square Value (.05)	2.134767
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	1.162948

Log-transformed Statistics	
Minimum of log data	2.477378
Maximum of log data	4.836282
Mean of log data	3.751606
Standard Deviation of log data	1.105636
Variance of log data	1.222432

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

111.5382

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.904643
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	111.5382

Gamma Distribution Test	
A-D Test Statistic	0.448059
A-D 5% Critical Value	0.687374
K-S Test Statistic	0.266348
K-S 5% Critical Value	0.362215
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	205.9445
Adjusted Gamma UCL	378.0422

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.84511
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1521.824
95% Chebyshev (MVUE) UCL	204.2482
97.5% Chebyshev (MVUE) UCL	263.5926
99% Chebyshev (MVUE) UCL	380.1632

95% Non-parametric UCLs	
CLT UCL	100.5389
Adj-CLT UCL (Adjusted for skewness)	101.6875
Mod-t UCL (Adjusted for skewness)	111.7173
Jackknife UCL	111.5382
Standard Bootstrap UCL	96.0021
Bootstrap-t UCL	113.2054
Hall's Bootstrap UCL	86.59333
Percentile Bootstrap UCL	97.428
BCA Bootstrap UCL	108.548
95% Chebyshev (Mean, Sd) UCL	161.8387
97.5% Chebyshev (Mean, Sd) UCL	204.4384
99% Chebyshev (Mean, Sd) UCL	288.1172

Data File

Variable: Thallium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	3
Minimum	1
Maximum	4.8
Mean	2.84
Median	1.8
Standard Deviation	1.818791
Variance	3.308
Coefficient of Variation	0.640419
Skewness	0.455676

Gamma Statistics	
k hat	2.914711
k star (bias corrected)	1.299218
Theta hat	0.974368
Theta star	2.185931
nu hat	29.14711
nu star	12.99218
Approx.Chi Square Value (.05)	5.886371
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	3.977487

Log-transformed Statistics	
Minimum of log data	0
Maximum of log data	1.568616
Mean of log data	0.862561
Standard Deviation of log data	0.687757
Variance of log data	0.47301

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

4.574018

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.79795
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.574018

Gamma Distribution Test	
A-D Test Statistic	0.532138
A-D 5% Critical Value	0.682785
K-S Test Statistic	0.298676
K-S 5% Critical Value	0.35951
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	6.268341
Adjusted Gamma UCL	9.276657

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.864829
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	10.40114
95% Chebyshev (MVUE) UCL	6.594307
97.5% Chebyshev (MVUE) UCL	8.215914
99% Chebyshev (MVUE) UCL	11.40125

95% Non-parametric UCLs	
CLT UCL	4.177904
Adj-CLT UCL (Adjusted for skewness)	4.355017
Mod-t UCL (Adjusted for skewness)	4.601644
Jackknife UCL	4.574018
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	6.385476
97.5% Chebyshev (Mean, Sd) UCL	7.919606
99% Chebyshev (Mean, Sd) UCL	10.93311

Data File

Variable: Vanadium (mg/kg dry)

Raw Statistics

Number of Valid Samples	2
Number of Unique Samples	2
Minimum	44.2
Maximum	69.4
Mean	56.8
Median	56.8

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Data File

Variable: Zinc (mg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	434
Maximum	3540
Mean	1432.8
Median	844
Standard Deviation	1292.377
Variance	1670237
Coefficient of Variation	0.901994
Skewness	1.453034

Gamma Statistics	
k hat	1.768481
k star (bias corrected)	0.840726
Theta hat	810.1866
Theta star	1704.242
nu hat	17.68481
nu star	8.407259
Approx.Chi Square Value (.05)	2.972352
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	1.750888

Log-transformed Statistics	
Minimum of log data	6.073045
Maximum of log data	8.171882
Mean of log data	6.958764
Standard Deviation of log data	0.865165
Variance of log data	0.748511

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

2664.94

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.835076
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2664.94

Gamma Distribution Test	
A-D Test Statistic	0.334023
A-D 5% Critical Value	0.685348
K-S Test Statistic	0.249768
K-S 5% Critical Value	0.361026
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	4052.657
Adjusted Gamma UCL	6879.892

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.939326
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	9963.178
95% Chebyshev (MVUE) UCL	3691.597
97.5% Chebyshev (MVUE) UCL	4682.971
99% Chebyshev (MVUE) UCL	6630.334

95% Non-parametric UCLs	
CLT UCL	2383.473
Adj-CLT UCL (Adjusted for skewness)	2784.779
Mod-t UCL (Adjusted for skewness)	2727.535
Jackknife UCL	2664.94
Standard Bootstrap UCL	2269.018
Bootstrap-t UCL	6871.293
Hall's Bootstrap UCL	8812.982
Percentile Bootstrap UCL	2404
BCA Bootstrap UCL	2918.8
95% Chebyshev (Mean, Sd) UCL	3952.106
97.5% Chebyshev (Mean, Sd) UCL	5042.211
99% Chebyshev (Mean, Sd) UCL	7183.513

Data File

Variable: Benz[a]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	230
Maximum	1700
Mean	730
Median	560
Standard Deviation	606.1353
Variance	367400
Coefficient of Variation	0.830322
Skewness	1.279502

Gamma Statistics	
k hat	1.938682
k star (bias corrected)	0.908806
Theta hat	376.5445
Theta star	803.2516
nu hat	19.38682
nu star	9.088061
Approx.Chi Square Value (.05)	3.379462
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	2.047871

Log-transformed Statistics	
Minimum of log data	5.438079
Maximum of log data	7.438384
Mean of log data	6.313495
Standard Deviation of log data	0.842272
Variance of log data	0.709422

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

1307.884

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.871021
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1307.884

Gamma Distribution Test	
A-D Test Statistic	0.291177
A-D 5% Critical Value	0.684688
K-S Test Statistic	0.234182
K-S 5% Critical Value	0.360617
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1963.119
Adjusted Gamma UCL	3239.601

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.935174
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4684.875
95% Chebyshev (MVUE) UCL	1879.529
97.5% Chebyshev (MVUE) UCL	2379.466
99% Chebyshev (MVUE) UCL	3361.497

95% Non-parametric UCLs	
CLT UCL	1175.874
Adj-CLT UCL (Adjusted for skewness)	1341.611
Mod-t UCL (Adjusted for skewness)	1333.735
Jackknife UCL	1307.884
Standard Bootstrap UCL	1133.838
Bootstrap-t UCL	1978.849
Hall's Bootstrap UCL	3416.562
Percentile Bootstrap UCL	1152
BCA Bootstrap UCL	1380
95% Chebyshev (Mean, Sd) UCL	1911.575
97.5% Chebyshev (Mean, Sd) UCL	2422.844
99% Chebyshev (Mean, Sd) UCL	3427.132

Data File

Variable: Benzo[a]pyrene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	300
Maximum	1600
Mean	728
Median	630
Standard Deviation	532.2312
Variance	283270
Coefficient of Variation	0.731087
Skewness	1.412378

Gamma Statistics	
k hat	2.647187
k star (bias corrected)	1.192208
Theta hat	275.0089
Theta star	610.6316
nu hat	26.47187
nu star	11.92208
Approx.Chi Square Value (.05)	5.174752
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	3.41593

Log-transformed Statistics	
Minimum of log data	5.703782
Maximum of log data	7.377759
Mean of log data	6.389689
Standard Deviation of log data	0.700612
Variance of log data	0.490858

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

1235.424

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.851441
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1235.424

Gamma Distribution Test	
A-D Test Statistic	0.337286
A-D 5% Critical Value	0.683272
K-S Test Statistic	0.241051
K-S 5% Critical Value	0.35979
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1677.235
Adjusted Gamma UCL	2540.824

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.916279
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2748.389
95% Chebyshev (MVUE) UCL	1686.118
97.5% Chebyshev (MVUE) UCL	2103.926
99% Chebyshev (MVUE) UCL	2924.628

95% Non-parametric UCLs	
CLT UCL	1119.51
Adj-CLT UCL (Adjusted for skewness)	1280.153
Mod-t UCL (Adjusted for skewness)	1260.481
Jackknife UCL	1235.424
Standard Bootstrap UCL	1073.014
Bootstrap-t UCL	1602.317
Hall's Bootstrap UCL	2849.276
Percentile Bootstrap UCL	1086
BCA Bootstrap UCL	1246
95% Chebyshev (Mean, Sd) UCL	1765.51
97.5% Chebyshev (Mean, Sd) UCL	2214.441
99% Chebyshev (Mean, Sd) UCL	3096.279

Data File

Variable: Benzo[b]fluoranthene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	300
Maximum	1800
Mean	788
Median	610
Standard Deviation	615.6866
Variance	379070
Coefficient of Variation	0.781328
Skewness	1.463785

Gamma Statistics	
k hat	2.35935
k star (bias corrected)	1.077073
Theta hat	333.9903
Theta star	731.6123
nu hat	23.5935
nu star	10.77073
Approx.Chi Square Value (.05)	4.428122
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	2.837263

Log-transformed Statistics	
Minimum of log data	5.703782
Maximum of log data	7.495542
Mean of log data	6.442854
Standard Deviation of log data	0.741441
Variance of log data	0.549735

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

1374.99

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.848759
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1374.99

Gamma Distribution Test	
A-D Test Statistic	0.31302
A-D 5% Critical Value	0.683796
K-S Test Statistic	0.225685
K-S 5% Critical Value	0.360093
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1916.69
Adjusted Gamma UCL	2991.382

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.933723
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3413.962
95% Chebyshev (MVUE) UCL	1875.731
97.5% Chebyshev (MVUE) UCL	2351.223
99% Chebyshev (MVUE) UCL	3285.234

95% Non-parametric UCLs	
CLT UCL	1240.9
Adj-CLT UCL (Adjusted for skewness)	1433.496
Mod-t UCL (Adjusted for skewness)	1405.031
Jackknife UCL	1374.99
Standard Bootstrap UCL	1203.118
Bootstrap-t UCL	2125.697
Hall's Bootstrap UCL	3321.39
Percentile Bootstrap UCL	1260
BCA Bootstrap UCL	1440
95% Chebyshev (Mean, Sd) UCL	1988.194
97.5% Chebyshev (Mean, Sd) UCL	2507.519
99% Chebyshev (Mean, Sd) UCL	3527.632

Data File

Variable: Dibenz[a,h]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	4
Minimum	91
Maximum	320
Mean	204.2
Median	170
Standard Deviation	90.68186
Variance	8223.2
Coefficient of Variation	0.444084
Skewness	0.171625

Gamma Statistics	
k hat	5.763126
k star (bias corrected)	2.438584
Theta hat	35.43216
Theta star	83.73713
nu hat	57.63126
nu star	24.38584
Approx.Chi Square Value (.05)	14.14072
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	10.88545

Log-transformed Statistics	
Minimum of log data	4.51086
Maximum of log data	5.768321
Mean of log data	5.22984
Standard Deviation of log data	0.490009
Variance of log data	0.240109

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

290.6552

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.94519
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	290.6552

Gamma Distribution Test	
A-D Test Statistic	0.296443
A-D 5% Critical Value	0.680431
K-S Test Statistic	0.212414
K-S 5% Critical Value	0.3582
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	352.1454
Adjusted Gamma UCL	457.4537

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.934423
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	430.1608
95% Chebyshev (MVUE) UCL	399.6739
97.5% Chebyshev (MVUE) UCL	483.7867
99% Chebyshev (MVUE) UCL	649.0099

95% Non-parametric UCLs	
CLT UCL	270.9057
Adj-CLT UCL (Adjusted for skewness)	274.2316
Mod-t UCL (Adjusted for skewness)	291.174
Jackknife UCL	290.6552
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	380.9715
97.5% Chebyshev (Mean, Sd) UCL	457.4607
99% Chebyshev (Mean, Sd) UCL	607.7088

Data File

Variable: Indeno[1,2,3-cd]pyrene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	220
Maximum	1200
Mean	538
Median	440
Standard Deviation	402.3928
Variance	161920
Coefficient of Variation	0.747942
Skewness	1.458302

Gamma Statistics	
k hat	2.572695
k star (bias corrected)	1.162411
Theta hat	209.1192
Theta star	462.831
nu hat	25.72695
nu star	11.62411
Approx.Chi Square Value (.05)	4.979519
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	3.263491

Log-transformed Statistics	
Minimum of log data	5.393628
Maximum of log data	7.090077
Mean of log data	6.081098
Standard Deviation of log data	0.707797
Variance of log data	0.500977

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

921.6375

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.846826
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	921.6375

Gamma Distribution Test	
A-D Test Statistic	0.331464
A-D 5% Critical Value	0.683408
K-S Test Statistic	0.234869
K-S 5% Critical Value	0.359869
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1255.899
Adjusted Gamma UCL	1916.283

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.92141
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2076.177
95% Chebyshev (MVUE) UCL	1250.13
97.5% Chebyshev (MVUE) UCL	1561.195
99% Chebyshev (MVUE) UCL	2172.223

95% Non-parametric UCLs	
CLT UCL	834.0005
Adj-CLT UCL (Adjusted for skewness)	959.4036
Mod-t UCL (Adjusted for skewness)	941.1978
Jackknife UCL	921.6375
Standard Bootstrap UCL	810.4274
Bootstrap-t UCL	1315.812
Hall's Bootstrap UCL	2027.656
Percentile Bootstrap UCL	840
BCA Bootstrap UCL	928
95% Chebyshev (Mean, Sd) UCL	1322.408
97.5% Chebyshev (Mean, Sd) UCL	1661.822
99% Chebyshev (Mean, Sd) UCL	2328.535

Data File Variable: Aroclor® 1248 (µg/kg dry)

Raw Statistics

Number of Valid Samples	2
Number of Unique Samples	2
Minimum	190
Maximum	240
Mean	215
Median	215

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Data File Variable: Aroclor® 1260 (µg/kg dry)

Raw Statistics

Number of Valid Samples	2
Number of Unique Samples	2
Minimum	260
Maximum	490
Mean	375
Median	375

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Data File Variable: Total PCBs (µg/kg dry)

Raw Statistics

Number of Valid Samples	2
Number of Unique Samples	2
Minimum	450
Maximum	730
Mean	590
Median	590

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Appendix E-5

Output for Developed Area Subsurface Soil

Data File

Variable: Arsenic (mg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	3.8
Maximum	9.9
Mean	6.65
Median	6.45
Standard Deviation	2.964793
Variance	8.79
Coefficient of Variation	0.445834
Skewness	0.168838

Gamma Statistics	
k hat	6.439105
k star (bias corrected)	1.776443
Theta hat	1.032752
Theta star	3.743436
nu hat	51.51284
nu star	14.21154
Approx.Chi Square Value (.05)	6.715282
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	1.335001
Maximum of log data	2.292535
Mean of log data	1.814961
Standard Deviation of log data	0.466628
Variance of log data	0.217742

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

10.13862

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.890528
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	10.13862

Gamma Distribution Test	
A-D Test Statistic	0.399537
A-D 5% Critical Value	0.658475
K-S Test Statistic	0.286637
K-S 5% Critical Value	0.395614
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	14.07339
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.890493
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	22.69002
95% Chebyshev (MVUE) UCL	13.31285
97.5% Chebyshev (MVUE) UCL	16.19385
99% Chebyshev (MVUE) UCL	21.853

95% Non-parametric UCLs	
CLT UCL	9.088326
Adj-CLT UCL (Adjusted for skewness)	9.222042
Mod-t UCL (Adjusted for skewness)	10.15947
Jackknife UCL	10.13862
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	13.11162
97.5% Chebyshev (Mean, Sd) UCL	15.90756
99% Chebyshev (Mean, Sd) UCL	21.39966

Data File

Variable: Barium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	59.5
Maximum	818
Mean	313.375
Median	188
Standard Deviation	354.7058
Variance	125816.2
Coefficient of Variation	1.131889
Skewness	1.465071

Gamma Statistics	
k hat	1.042927
k star (bias corrected)	0.427398
Theta hat	300.4764
Theta star	733.2151
nu hat	8.343418
nu star	3.419188
Approx.Chi Square Value (.05)	0.506507
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	4.085976
Maximum of log data	6.706862
Mean of log data	5.196633
Standard Deviation of log data	1.242511
Variance of log data	1.543834

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

730.7508

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.831279
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	730.7508

Gamma Distribution Test	
A-D Test Statistic	0.37338
A-D 5% Critical Value	0.666246
K-S Test Statistic	0.303823
K-S 5% Critical Value	0.402196
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2115.446
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.900853
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1122434
95% Chebyshev (MVUE) UCL	1043.048
97.5% Chebyshev (MVUE) UCL	1362.402
99% Chebyshev (MVUE) UCL	1989.712

95% Non-parametric UCLs	
CLT UCL	605.0946
Adj-CLT UCL (Adjusted for skewness)	743.9132
Mod-t UCL (Adjusted for skewness)	752.4037
Jackknife UCL	730.7508
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	1086.438
97.5% Chebyshev (Mean, Sd) UCL	1420.944
99% Chebyshev (Mean, Sd) UCL	2078.014

Data File

Variable: Chromium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	10.3
Maximum	131
Mean	46
Median	21.35
Standard Deviation	57.2746
Variance	3280.38
Coefficient of Variation	1.2451
Skewness	1.878204

Gamma Statistics	
k hat	1.073019
k star (bias corrected)	0.434921
Theta hat	42.86969
Theta star	105.7662
nu hat	8.584153
nu star	3.479372
Approx.Chi Square Value (.05)	0.527326
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	2.332144
Maximum of log data	4.875197
Mean of log data	3.295046
Standard Deviation of log data	1.14318
Variance of log data	1.30686

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

303.5143

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.744764
Shapiro-Wilk 5% Critical Value	0.748
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	113.394

Gamma Distribution Test	
A-D Test Statistic	0.456523
A-D 5% Critical Value	0.665991
K-S Test Statistic	0.289628
K-S 5% Critical Value	0.402018
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	303.5143
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.900333
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	44307.09
95% Chebyshev (MVUE) UCL	138.0049
97.5% Chebyshev (MVUE) UCL	179.4226
99% Chebyshev (MVUE) UCL	260.7797

95% Non-parametric UCLs	
CLT UCL	93.10417
Adj-CLT UCL (Adjusted for skewness)	121.8401
Mod-t UCL (Adjusted for skewness)	117.8762
Jackknife UCL	113.394
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	170.8271
97.5% Chebyshev (Mean, Sd) UCL	224.8399
99% Chebyshev (Mean, Sd) UCL	330.9375

Data File

Variable: Copper (mg/kg dry)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	23.4
Maximum	7420
Mean	1669.68
Median	289
Standard Deviation	3223.056
Variance	10388088
Coefficient of Variation	1.930343
Skewness	2.206933

Gamma Statistics	
k hat	0.343761
k star (bias corrected)	0.270838
Theta hat	4857.089
Theta star	6164.868
nu hat	3.437615
nu star	2.708379
Approx.Chi Square Value (.05)	0.2914
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	0.109998

Log-transformed Statistics	
Minimum of log data	3.152736
Maximum of log data	8.911934
Mean of log data	5.458532
Standard Deviation of log data	2.415681
Variance of log data	5.835515

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Adjusted Gamma UCL

41111.07

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.614434
Shapiro-Wilk 5% Critical Value	0.762
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4742.511

Gamma Distribution Test	
A-D Test Statistic	0.458094
A-D 5% Critical Value	0.73299
K-S Test Statistic	0.272489
K-S 5% Critical Value	0.378096
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15518.64
Adjusted Gamma UCL	41111.07

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.906928
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3.61E+09
95% Chebyshev (MVUE) UCL	6492.62
97.5% Chebyshev (MVUE) UCL	8687.374
99% Chebyshev (MVUE) UCL	12998.54

95% Non-parametric UCLs	
CLT UCL	4040.563
Adj-CLT UCL (Adjusted for skewness)	5560.646
Mod-t UCL (Adjusted for skewness)	4979.613
Jackknife UCL	4742.511
Standard Bootstrap UCL	3796.433
Bootstrap-t UCL	35812.85
Hall's Bootstrap UCL	26445.31
Percentile Bootstrap UCL	4461.36
BCA Bootstrap UCL	5940.68
95% Chebyshev (Mean, Sd) UCL	7952.572
97.5% Chebyshev (Mean, Sd) UCL	10671.18
99% Chebyshev (Mean, Sd) UCL	16011.37

Data File

Variable: Manganese (mg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	241
Maximum	812
Mean	489.5
Median	452.5
Standard Deviation	265.1019
Variance	70279
Coefficient of Variation	0.541577
Skewness	0.479323

Gamma Statistics	
k hat	4.426039
k star (bias corrected)	1.273176
Theta hat	110.5955
Theta star	384.4715
nu hat	35.40831
nu star	10.18541
Approx.Chi Square Value (.05)	4.057121
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	5.484797
Maximum of log data	6.6995
Mean of log data	6.076184
Standard Deviation of log data	0.565993
Variance of log data	0.320348

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

801.4405

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.923226
Shapiro-Wilk 5% Critical Value	0.748
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	801.4405

Gamma Distribution Test	
A-D Test Statistic	0.318311
A-D 5% Critical Value	0.658944
K-S Test Statistic	0.272208
K-S 5% Critical Value	0.396045
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1228.891
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.932288
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2851.815
95% Chebyshev (MVUE) UCL	1079.187
97.5% Chebyshev (MVUE) UCL	1334.309
99% Chebyshev (MVUE) UCL	1835.447

95% Non-parametric UCLs	
CLT UCL	707.5269
Adj-CLT UCL (Adjusted for skewness)	741.4708
Mod-t UCL (Adjusted for skewness)	806.7351
Jackknife UCL	801.4405
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	1067.276
97.5% Chebyshev (Mean, Sd) UCL	1317.28
99% Chebyshev (Mean, Sd) UCL	1808.365

Data File

Variable: Mercury (mg/kg dry)

Raw Statistics	
Number of Valid Samples	35
Number of Unique Samples	35
Minimum	0.42
Maximum	5150
Mean	584.8074
Median	12.3
Standard Deviation	1381.345
Variance	1908115
Coefficient of Variation	2.362052
Skewness	2.662081

Gamma Statistics	
k hat	0.220839
k star (bias corrected)	0.220958
Theta hat	2648.117
Theta star	2646.696
nu hat	15.45873
nu star	15.46703
Approx.Chi Square Value (.05)	7.586308
Adjusted Level of Significance	0.0425
Adjusted Chi Square Value	7.324363

Log-transformed Statistics	
Minimum of log data	-0.867501
Maximum of log data	8.546752
Mean of log data	3.090473
Standard Deviation of log data	2.899816
Variance of log data	8.408934

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL
2908.003

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.484855
Shapiro-Wilk 5% Critical Value	0.934
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	979.6212

Gamma Distribution Test	
A-D Test Statistic	2.597222
A-D 5% Critical Value	0.890545
K-S Test Statistic	0.235319
K-S 5% Critical Value	0.163972
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1192.31
Adjusted Gamma UCL	1234.952

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.920408
Shapiro-Wilk 5% Critical Value	0.934
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	18987.73
95% Chebyshev (MVUE) UCL	3679.078
97.5% Chebyshev (MVUE) UCL	4879.237
99% Chebyshev (MVUE) UCL	7236.716

95% Non-parametric UCLs	
CLT UCL	968.8643
Adj-CLT UCL (Adjusted for skewness)	1081.127
Mod-t UCL (Adjusted for skewness)	997.132
Jackknife UCL	979.6212
Standard Bootstrap UCL	962.5908
Bootstrap-t UCL	1242.82
Hall's Bootstrap UCL	1000.275
Percentile Bootstrap UCL	987.0097
BCA Bootstrap UCL	1203.846
95% Chebyshev (Mean, Sd) UCL	1602.567
97.5% Chebyshev (Mean, Sd) UCL	2042.952
99% Chebyshev (Mean, Sd) UCL	2908.003

Data File

Variable: Thallium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	0.25
Maximum	5.4
Mean	1.7025
Median	0.58
Standard Deviation	2.483685
Variance	6.168692
Coefficient of Variation	1.458846
Skewness	1.913163

Gamma Statistics	
k hat	0.732266
k star (bias corrected)	0.349733
Theta hat	2.324976
Theta star	4.867998
nu hat	5.858126
nu star	2.797865
Approx.Chi Square Value (.05)	0.314993
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	-1.386294
Maximum of log data	1.686399
Mean of log data	-0.288082
Standard Deviation of log data	1.444472
Variance of log data	2.086499

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

15.12214

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.718483
Shapiro-Wilk 5% Critical Value	0.748
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.625007

Gamma Distribution Test	
A-D Test Statistic	0.504906
A-D 5% Critical Value	0.671053
K-S Test Statistic	0.290343
K-S 5% Critical Value	0.405364
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15.12214
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.859722
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	97732.44
95% Chebyshev (MVUE) UCL	5.531683
97.5% Chebyshev (MVUE) UCL	7.280339
99% Chebyshev (MVUE) UCL	10.71524

95% Non-parametric UCLs	
CLT UCL	3.745149
Adj-CLT UCL (Adjusted for skewness)	5.014462
Mod-t UCL (Adjusted for skewness)	4.822994
Jackknife UCL	4.625007
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	7.115566
97.5% Chebyshev (Mean, Sd) UCL	9.457804
99% Chebyshev (Mean, Sd) UCL	14.05868

Data File

Variable: Benzene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	4
Number of Unique Samples	4
Minimum	1.5
Maximum	2800
Mean	754.075
Median	107.4
Standard Deviation	1367.432
Variance	1869870
Coefficient of Variation	1.81339
Skewness	1.970055

Gamma Statistics	
k hat	0.252319
k star (bias corrected)	0.229747
Theta hat	2988.573
Theta star	3282.204
nu hat	2.018555
nu star	1.837972
Approx.Chi Square Value (.05)	0.132528
Adjusted Level of Significance	N/A
Adjusted Chi Square Value	N/A

Log-transformed Statistics	
Minimum of log data	0.405465
Maximum of log data	7.937375
Mean of log data	3.814641
Standard Deviation of log data	3.464703
Variance of log data	12.00417

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Adjusted Gamma UCL not available tı
10457.95

N<10, use detected maximum

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.683108
Shapiro-Wilk 5% Critical Value	0.748
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2363.107

Gamma Distribution Test	
A-D Test Statistic	0.340411
A-D 5% Critical Value	0.717667
K-S Test Statistic	0.282365
K-S 5% Critical Value	0.421083
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	10457.95
Adjusted Gamma UCL	N/A

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.937209
Shapiro-Wilk 5% Critical Value	0.748
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	8.72E+30
95% Chebyshev (MVUE) UCL	4029.78
97.5% Chebyshev (MVUE) UCL	5432.185
99% Chebyshev (MVUE) UCL	8186.937

95% Non-parametric UCLs	
CLT UCL	1878.688
Adj-CLT UCL (Adjusted for skewness)	2598.31
Mod-t UCL (Adjusted for skewness)	2475.353
Jackknife UCL	2363.107
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	3734.323
97.5% Chebyshev (Mean, Sd) UCL	5023.879
99% Chebyshev (Mean, Sd) UCL	7556.962

Data File Variable: 2-Methylnaphthalene (µg/kg dry)

Raw Statistics

Number of Valid Samples	1
Number of Unique Samples	1
Minimum	11000
Maximum	11000
Mean	11000
Median	11000

Too Few Observations To Calculate UCLs

N=1, used UCL for undeveloped area subsurface soils

Data File Variable: Aroclor® 1260 (µg/kg dry)

Raw Statistics

Number of Valid Samples	1
Number of Unique Samples	1
Minimum	360
Maximum	360
Mean	360
Median	360

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Data File

Variable: Total PCB (µg/kg dry)

Raw Statistics

Number of Valid Samples	1
Number of Unique Samples	1
Minimum	360
Maximum	360
Mean	360
Median	360

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Appendix E-6

Output for Undeveloped Area Subsurface Soil

Data File

Variable: Antimony (mg/kg dry)

Raw Statistics	
Number of Valid Samples	48
Number of Unique Samples	45
Minimum	0.225
Maximum	97.3
Mean	7.9317917
Median	3.7
Standard Deviation	15.615717
Variance	243.85063
Coefficient of Variation	1.9687503
Skewness	4.4346342

Gamma Statistics	
k hat	0.5481022
k star (bias corrected)	0.5277347
Theta hat	14.471374
Theta star	15.029885
nu hat	52.617811
nu star	50.662531
Approx.Chi Square Value (.05)	35.31491
Adjusted Level of Significance	0.045
Adjusted Chi Square Value	34.917379

Log-transformed Statistics	
Minimum of log data	-1.491655
Maximum of log data	4.577799
Mean of log data	0.9282177
Standard Deviation of log data	1.6121021
Variance of log data	2.5988732

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

11.37889

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.506652
Shapiro-Wilk 5% Critical Value	0.947
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	11.71373

Gamma Distribution Test	
A-D Test Statistic	1.148409
A-D 5% Critical Value	0.809689
K-S Test Statistic	0.114208
K-S 5% Critical Value	0.134755
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	11.37889
Adjusted Gamma UCL	11.50844

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.937948
Shapiro-Wilk 5% Critical Value	0.947
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	19.0256
95% Chebyshev (MVUE) UCL	20.7824
97.5% Chebyshev (MVUE) UCL	25.98691
99% Chebyshev (MVUE) UCL	36.21015

95% Non-parametric UCLs	
CLT UCL	11.63918
Adj-CLT UCL (Adjusted for skewness)	13.18074
Mod-t UCL (Adjusted for skewness)	11.95418
Jackknife UCL	11.71373
Standard Bootstrap UCL	11.58026
Bootstrap-t UCL	15.8476
Hall's Bootstrap UCL	26.86388
Percentile Bootstrap UCL	11.93433
BCA Bootstrap UCL	14.838
95% Chebyshev (Mean, Sd) UCL	17.75647
97.5% Chebyshev (Mean, Sd) UCL	22.00761
99% Chebyshev (Mean, Sd) UCL	30.35816

Data File

Variable: Arsenic (mg/kg dry)

Raw Statistics	
Number of Valid Samples	51
Number of Unique Samples	44
Minimum	0.23
Maximum	120
Mean	14.12788
Median	10.1
Standard Deviation	18.68955
Variance	349.2993
Coefficient of Variation	1.322884
Skewness	3.961613

Gamma Statistics	
k hat	0.847158
k star (bias corrected)	0.810397
Theta hat	16.67679
Theta star	17.43328
nu hat	86.41014
nu star	82.66053
Approx.Chi Square Value (.05)	62.70411
Adjusted Level of Significance	0.045294
Adjusted Chi Square Value	62.19864

Log-transformed Statistics	
Minimum of log data	-1.469676
Maximum of log data	4.787492
Mean of log data	1.952777
Standard Deviation of log data	1.382916
Variance of log data	1.912456

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

18.62427

Normal Distribution Test	
Lilliefors Test Statisitic	0.245693
Lilliefors 5% Critical Value	0.124065
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	18.51383

Gamma Distribution Test	
A-D Test Statistic	0.454891
A-D 5% Critical Value	0.788035
K-S Test Statistic	0.10268
K-S 5% Critical Value	0.128712
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	18.62427
Adjusted Gamma UCL	18.77562

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.153162
Lilliefors 5% Critical Value	0.124065
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	31.31901
95% Chebyshev (MVUE) UCL	37.05184
97.5% Chebyshev (MVUE) UCL	45.42138
99% Chebyshev (MVUE) UCL	61.8617

95% Non-parametric UCLs	
CLT UCL	18.43256
Adj-CLT UCL (Adjusted for skewness)	19.98381
Mod-t UCL (Adjusted for skewness)	18.75579
Jackknife UCL	18.51383
Standard Bootstrap UCL	18.49682
Bootstrap-t UCL	21.21756
Hall's Bootstrap UCL	37.98438
Percentile Bootstrap UCL	18.8352
BCA Bootstrap UCL	21.76724
95% Chebyshev (Mean, Sd) UCL	25.53539
97.5% Chebyshev (Mean, Sd) UCL	30.47142
99% Chebyshev (Mean, Sd) UCL	40.16731

Data File

Variable: Barium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	50
Number of Unique Samples	50
Minimum	2.8
Maximum	11200
Mean	791.782
Median	322.5
Standard Deviation	1882.369
Variance	3543312
Coefficient of Variation	2.377383
Skewness	4.762747

Gamma Statistics	
k hat	0.555474
k star (bias corrected)	0.535479
Theta hat	1425.416
Theta star	1478.642
nu hat	55.54744
nu star	53.54793
Approx.Chi Square Value (.05)	37.73326
Adjusted Level of Significance	0.0452
Adjusted Chi Square Value	37.33858

Log-transformed Statistics	
Minimum of log data	1.029619
Maximum of log data	9.323669
Mean of log data	5.549067
Standard Deviation of log data	1.603005
Variance of log data	2.569624

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

1855.044

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.380063
Shapiro-Wilk 5% Critical Value	0.947
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1238.092

Gamma Distribution Test	
A-D Test Statistic	1.64003
A-D 5% Critical Value	0.809628
K-S Test Statistic	0.162654
K-S 5% Critical Value	0.131952
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1123.632
Adjusted Gamma UCL	1135.509

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.956987
Shapiro-Wilk 5% Critical Value	0.947
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1855.044
95% Chebyshev (MVUE) UCL	2058.177
97.5% Chebyshev (MVUE) UCL	2568.36
99% Chebyshev (MVUE) UCL	3570.516

95% Non-parametric UCLs	
CLT UCL	1229.654
Adj-CLT UCL (Adjusted for skewness)	1421.244
Mod-t UCL (Adjusted for skewness)	1267.976
Jackknife UCL	1238.092
Standard Bootstrap UCL	1224.36
Bootstrap-t UCL	2728.26
Hall's Bootstrap UCL	3593.008
Percentile Bootstrap UCL	1287.812
BCA Bootstrap UCL	1609.702
95% Chebyshev (Mean, Sd) UCL	1952.152
97.5% Chebyshev (Mean, Sd) UCL	2454.245
99% Chebyshev (Mean, Sd) UCL	3440.51

Data File

Variable: Cadmium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	50
Number of Unique Samples	43
Minimum	0.085
Maximum	36.1
Mean	5.6672
Median	3.8
Standard Deviation	6.774648
Variance	45.89585
Coefficient of Variation	1.195414
Skewness	2.574112

Gamma Statistics	
k hat	0.845386
k star (bias corrected)	0.807996
Theta hat	6.703683
Theta star	7.013894
nu hat	84.53861
nu star	80.79963
Approx.Chi Square Value (.05)	61.08334
Adjusted Level of Significance	0.0452
Adjusted Chi Square Value	60.57441

Log-transformed Statistics	
Minimum of log data	-2.465104
Maximum of log data	3.586293
Mean of log data	1.037677
Standard Deviation of log data	1.362644
Variance of log data	1.856798

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

7.496441

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.734542
Shapiro-Wilk 5% Critical Value	0.947
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	7.273469

Gamma Distribution Test	
A-D Test Statistic	0.387959
A-D 5% Critical Value	0.788241
K-S Test Statistic	0.093852
K-S 5% Critical Value	0.129827
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	7.496441
Adjusted Gamma UCL	7.559424

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.953362
Shapiro-Wilk 5% Critical Value	0.947
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	12.13092
95% Chebyshev (MVUE) UCL	14.36037
97.5% Chebyshev (MVUE) UCL	17.58712
99% Chebyshev (MVUE) UCL	23.92544

95% Non-parametric UCLs	
CLT UCL	7.243101
Adj-CLT UCL (Adjusted for skewness)	7.615771
Mod-t UCL (Adjusted for skewness)	7.331598
Jackknife UCL	7.273469
Standard Bootstrap UCL	7.202545
Bootstrap-t UCL	7.917073
Hall's Bootstrap UCL	8.217786
Percentile Bootstrap UCL	7.27192
BCA Bootstrap UCL	8.143
95% Chebyshev (Mean, Sd) UCL	9.843373
97.5% Chebyshev (Mean, Sd) UCL	11.65041
99% Chebyshev (Mean, Sd) UCL	15.19997

Data File

Variable: Chromium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	51
Number of Unique Samples	48
Minimum	1
Maximum	9840
Mean	290.3655
Median	45.1
Standard Deviation	1370.117
Variance	1877220
Coefficient of Variation	4.718594
Skewness	7.04355

Gamma Statistics	
k hat	0.396664
k star (bias corrected)	0.386403
Theta hat	732.0191
Theta star	751.4585
nu hat	40.45971
nu star	39.41306
Approx.Chi Square Value (.05)	26.02897
Adjusted Level of Significance	0.045294
Adjusted Chi Square Value	25.71185

Log-transformed Statistics	
Minimum of log data	0
Maximum of log data	9.194211
Mean of log data	4.009969
Standard Deviation of log data	1.443643
Variance of log data	2.084105

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL
1488.498

Normal Distribution Test	
Lilliefors Test Statisitic	0.421355
Lilliefors 5% Critical Value	0.124065
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	611.8958

Gamma Distribution Test	
A-D Test Statistic	6.174646
A-D 5% Critical Value	0.839265
K-S Test Statistic	0.279769
K-S 5% Critical Value	0.133158
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	439.6713
Adjusted Gamma UCL	445.0941

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.151011
Lilliefors 5% Critical Value	0.124065
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	277.5158
95% Chebyshev (MVUE) UCL	324.0634
97.5% Chebyshev (MVUE) UCL	399.2619
99% Chebyshev (MVUE) UCL	546.9747

95% Non-parametric UCLs	
CLT UCL	605.9385
Adj-CLT UCL (Adjusted for skewness)	808.1284
Mod-t UCL (Adjusted for skewness)	643.4333
Jackknife UCL	611.8958
Standard Bootstrap UCL	598.0961
Bootstrap-t UCL	3044.549
Hall's Bootstrap UCL	1787.603
Percentile Bootstrap UCL	666.189
BCA Bootstrap UCL	883.6369
95% Chebyshev (Mean, Sd) UCL	1126.641
97.5% Chebyshev (Mean, Sd) UCL	1488.498
99% Chebyshev (Mean, Sd) UCL	2199.296

Data File

Variable: Copper (mg/kg dry)

Raw Statistics	
Number of Valid Samples	51
Number of Unique Samples	49
Minimum	0.2
Maximum	8720
Mean	442.9361
Median	202
Standard Deviation	1232.764
Variance	1519708
Coefficient of Variation	2.783165
Skewness	6.350137

Gamma Statistics	
k hat	0.528122
k star (bias corrected)	0.510127
Theta hat	838.701
Theta star	868.2851
nu hat	53.8684
nu star	52.033
Approx.Chi Square Value (.05)	36.46192
Adjusted Level of Significance	0.045294
Adjusted Chi Square Value	36.08225

Log-transformed Statistics	
Minimum of log data	-1.609438
Maximum of log data	9.073375
Mean of log data	4.900806
Standard Deviation of log data	1.807704
Variance of log data	3.267794

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL
1520.957

Normal Distribution Test	
Lilliefors Test Statisitic	0.394062
Lilliefors 5% Critical Value	0.124065
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	732.2333

Gamma Distribution Test	
A-D Test Statistic	2.250372
A-D 5% Critical Value	0.812054
K-S Test Statistic	0.20048
K-S 5% Critical Value	0.131068
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	632.0921
Adjusted Gamma UCL	638.7433

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.220536
Lilliefors 5% Critical Value	0.124065
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1590.986
95% Chebyshev (MVUE) UCL	1632.754
97.5% Chebyshev (MVUE) UCL	2063.595
99% Chebyshev (MVUE) UCL	2909.9

95% Non-parametric UCLs	
CLT UCL	726.8732
Adj-CLT UCL (Adjusted for skewness)	890.8844
Mod-t UCL (Adjusted for skewness)	757.8157
Jackknife UCL	732.2333
Standard Bootstrap UCL	731.7476
Bootstrap-t UCL	1800.572
Hall's Bootstrap UCL	1776.02
Percentile Bootstrap UCL	771.3124
BCA Bootstrap UCL	979.9608
95% Chebyshev (Mean, Sd) UCL	1195.376
97.5% Chebyshev (Mean, Sd) UCL	1520.957
99% Chebyshev (Mean, Sd) UCL	2160.499

Data File

Variable: Lead (mg/kg dry)

Raw Statistics	
Number of Valid Samples	50
Number of Unique Samples	50
Minimum	2.77
Maximum	58200
Mean	2096.317
Median	664.5
Standard Deviation	8156.831
Variance	66533898
Coefficient of Variation	3.891029
Skewness	6.910286

Gamma Statistics	
k hat	0.379295
k star (bias corrected)	0.36987
Theta hat	5526.881
Theta star	5667.707
nu hat	37.92948
nu star	36.98704
Approx.Chi Square Value (.05)	24.06227
Adjusted Level of Significance	0.0452
Adjusted Chi Square Value	23.75195

Log-transformed Statistics	
Minimum of log data	1.018847
Maximum of log data	10.97164
Mean of log data	5.898078
Standard Deviation of log data	2.099428
Variance of log data	4.407597

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

13574

Use Mean for Lead Model

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.227884
Shapiro-Wilk 5% Critical Value	0.947
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4030.303

Gamma Distribution Test	
A-D Test Statistic	1.995748
A-D 5% Critical Value	0.843318
K-S Test Statistic	0.172081
K-S 5% Critical Value	0.134609
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3222.331
Adjusted Gamma UCL	3264.43

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.920631
Shapiro-Wilk 5% Critical Value	0.947
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	9961.115
95% Chebyshev (MVUE) UCL	8484.33
97.5% Chebyshev (MVUE) UCL	10897.47
99% Chebyshev (MVUE) UCL	15637.6

95% Non-parametric UCLs	
CLT UCL	3993.739
Adj-CLT UCL (Adjusted for skewness)	5198.297
Mod-t UCL (Adjusted for skewness)	4218.189
Jackknife UCL	4030.303
Standard Bootstrap UCL	4017.575
Bootstrap-t UCL	14111.71
Hall's Bootstrap UCL	11558.12
Percentile Bootstrap UCL	4396.086
BCA Bootstrap UCL	5566.17
95% Chebyshev (Mean, Sd) UCL	7124.526
97.5% Chebyshev (Mean, Sd) UCL	9300.236
99% Chebyshev (Mean, Sd) UCL	13574

Data File

Variable: Manganese (mg/kg dry)

Raw Statistics

Number of Valid Samples	50
Number of Unique Samples	48
Minimum	9.3
Maximum	23300
Mean	777.908
Median	313.5
Standard Deviation	3258.069
Variance	10615010
Coefficient of Variation	4.188244
Skewness	7.017506

Gamma Statistics

k hat	0.523734
k star (bias corrected)	0.505644
Theta hat	1485.31
Theta star	1538.451
nu hat	52.37344
nu star	50.56436
Approx.Chi Square Value (.05)	35.23287
Adjusted Level of Significance	0.0452
Adjusted Chi Square Value	34.85231

Log-transformed Statistics

Minimum of log data	2.230014
Maximum of log data	10.05621
Mean of log data	5.452461
Standard Deviation of log data	1.276347
Variance of log data	1.629062

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL
3655.356

Normal Distribution Test

Shapiro-Wilk Test Statisitic	0.192778
Shapiro-Wilk 5% Critical Value	0.947

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1550.396

Gamma Distribution Test

A-D Test Statistic	5.475274
A-D 5% Critical Value	0.812284
K-S Test Statistic	0.292867
K-S 5% Critical Value	0.132208

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1116.413
Adjusted Gamma UCL	1128.603

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.898601
Shapiro-Wilk 5% Critical Value	0.947

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	849.3213
95% Chebyshev (MVUE) UCL	1019.836
97.5% Chebyshev (MVUE) UCL	1239.497
99% Chebyshev (MVUE) UCL	1670.979

95% Non-parametric UCLs

CLT UCL	1535.792
Adj-CLT UCL (Adjusted for skewness)	2024.392
Mod-t UCL (Adjusted for skewness)	1626.608
Jackknife UCL	1550.396
Standard Bootstrap UCL	1535.225
Bootstrap-t UCL	8719.482
Hall's Bootstrap UCL	5105.081
Percentile Bootstrap UCL	1698.194
BCA Bootstrap UCL	2604.376
95% Chebyshev (Mean, Sd) UCL	2786.316
97.5% Chebyshev (Mean, Sd) UCL	3655.356
99% Chebyshev (Mean, Sd) UCL	5362.417

Data File

Variable: Mercury (mg/kg dry)

Raw Statistics	
Number of Valid Samples	100
Number of Unique Samples	95
Minimum	0.075
Maximum	34700
Mean	480.9064
Median	21.7
Standard Deviation	3481.236
Variance	12119003
Coefficient of Variation	7.238905
Skewness	9.79457

Gamma Statistics	
k hat	0.221514
k star (bias corrected)	0.221535
Theta hat	2171.001
Theta star	2170.793
nu hat	44.30273
nu star	44.30698
Approx.Chi Square Value (.05)	30.03793
Adjusted Level of Significance	0.0476
Adjusted Chi Square Value	29.86634

Log-transformed Statistics	
Minimum of log data	-2.590267
Maximum of log data	10.45449
Mean of log data	2.906438
Standard Deviation of log data	2.36526
Variance of log data	5.594454

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

731.7946

Normal Distribution Test	
Lilliefors Test Statisitic	0.445072
Lilliefors 5% Critical Value	0.0886
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1058.928

Gamma Distribution Test	
A-D Test Statistic	10.311
A-D 5% Critical Value	0.902696
K-S Test Statistic	0.263921
K-S 5% Critical Value	0.09865
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	709.3535
Adjusted Gamma UCL	713.4288

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.057294
Lilliefors 5% Critical Value	0.0886
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	731.7946
95% Chebyshev (MVUE) UCL	747.6569
97.5% Chebyshev (MVUE) UCL	953.6008
99% Chebyshev (MVUE) UCL	1358.138

95% Non-parametric UCLs	
CLT UCL	1053.519
Adj-CLT UCL (Adjusted for skewness)	1417.852
Mod-t UCL (Adjusted for skewness)	1115.756
Jackknife UCL	1058.928
Standard Bootstrap UCL	1049.994
Bootstrap-t UCL	7010.524
Hall's Bootstrap UCL	3795.964
Percentile Bootstrap UCL	1166.301
BCA Bootstrap UCL	1857.001
95% Chebyshev (Mean, Sd) UCL	1998.342
97.5% Chebyshev (Mean, Sd) UCL	2654.938
99% Chebyshev (Mean, Sd) UCL	3944.692

Data File

Variable: Methyl mercury (ng/g dry)

Raw Statistics	
Number of Valid Samples	7
Number of Unique Samples	7
Minimum	0.1
Maximum	7.44
Mean	2.9428571
Median	2.38
Standard Deviation	2.7891439
Variance	7.7793238
Coefficient of Variation	0.9477674
Skewness	0.5625599

Gamma Statistics	
k hat	0.7216249
k star (bias corrected)	0.5075952
Theta hat	4.0780982
Theta star	5.7976461
nu hat	10.102748
nu star	7.1063324
Approx.Chi Square Value (.05)	2.2284875
Adjusted Level of Significance	0.01584
Adjusted Chi Square Value	1.4964788

Log-transformed Statistics	
Minimum of log data	-2.302585
Maximum of log data	2.0068708
Mean of log data	0.2454309
Standard Deviation of log data	1.763095
Variance of log data	3.108504

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

4.991352

N<10, use detected max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.917598
Shapiro-Wilk 5% Critical Value	0.803
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.991352

Gamma Distribution Test	
A-D Test Statistic	0.372993
A-D 5% Critical Value	0.737888
K-S Test Statistic	0.19789
K-S 5% Critical Value	0.32318
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	9.384357
Adjusted Gamma UCL	13.97475

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.855002
Shapiro-Wilk 5% Critical Value	0.803
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	454.4327
95% Chebyshev (MVUE) UCL	15.41659
97.5% Chebyshev (MVUE) UCL	20.31296
99% Chebyshev (MVUE) UCL	29.93093

95% Non-parametric UCLs	
CLT UCL	4.676857
Adj-CLT UCL (Adjusted for skewness)	4.916367
Mod-t UCL (Adjusted for skewness)	5.02871
Jackknife UCL	4.991352
Standard Bootstrap UCL	4.580772
Bootstrap-t UCL	5.504657
Hall's Bootstrap UCL	4.598652
Percentile Bootstrap UCL	4.591429
BCA Bootstrap UCL	4.265714
95% Chebyshev (Mean, Sd) UCL	7.537997
97.5% Chebyshev (Mean, Sd) UCL	9.526317
99% Chebyshev (Mean, Sd) UCL	13.43199

Data File

Variable: Nickel (mg/kg dry)

Raw Statistics	
Number of Valid Samples	51
Number of Unique Samples	51
Minimum	0.13
Maximum	317
Mean	63.00686
Median	42.7
Standard Deviation	64.81368
Variance	4200.813
Coefficient of Variation	1.028677
Skewness	1.985084

Gamma Statistics	
k hat	1.05266
k star (bias corrected)	1.003811
Theta hat	59.85491
Theta star	62.76768
nu hat	107.3713
nu star	102.3887
Approx.Chi Square Value (.05)	80.03702
Adjusted Level of Significance	0.045294
Adjusted Chi Square Value	79.46272

Log-transformed Statistics	
Minimum of log data	-2.040221
Maximum of log data	5.758902
Mean of log data	3.598147
Standard Deviation of log data	1.297545
Variance of log data	1.683622

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

80.60258

Normal Distribution Test	
Lilliefors Test Statisitic	0.265444
Lilliefors 5% Critical Value	0.124065
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	78.21692

Gamma Distribution Test	
A-D Test Statistic	0.639016
A-D 5% Critical Value	0.778564
K-S Test Statistic	0.136637
K-S 5% Critical Value	0.127689
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	80.60258
Adjusted Gamma UCL	81.18511

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.126799
Lilliefors 5% Critical Value	0.124065
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	137.4846
95% Chebyshev (MVUE) UCL	165.0125
97.5% Chebyshev (MVUE) UCL	200.7849
99% Chebyshev (MVUE) UCL	271.0529

95% Non-parametric UCLs	
CLT UCL	77.93511
Adj-CLT UCL (Adjusted for skewness)	80.63071
Mod-t UCL (Adjusted for skewness)	78.63738
Jackknife UCL	78.21692
Standard Bootstrap UCL	77.86736
Bootstrap-t UCL	82.02183
Hall's Bootstrap UCL	81.41809
Percentile Bootstrap UCL	77.93235
BCA Bootstrap UCL	85.37235
95% Chebyshev (Mean, Sd) UCL	102.5671
97.5% Chebyshev (Mean, Sd) UCL	119.6848
99% Chebyshev (Mean, Sd) UCL	153.3092

Data File

Variable: Selenium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	50
Number of Unique Samples	42
Minimum	0.15
Maximum	42.8
Mean	2.12676
Median	0.87
Standard Deviation	6.02735
Variance	36.32894
Coefficient of Variation	2.834053
Skewness	6.534181

Gamma Statistics	
k hat	0.732728
k star (bias corrected)	0.702098
Theta hat	2.902523
Theta star	3.029151
nu hat	73.27281
nu star	70.20978
Approx.Chi Square Value (.05)	51.91638
Adjusted Level of Significance	0.0452
Adjusted Chi Square Value	51.44915

Log-transformed Statistics	
Minimum of log data	-1.89712
Maximum of log data	3.756538
Mean of log data	-0.064992
Standard Deviation of log data	1.023252
Variance of log data	1.047044

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL
7.449971

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.289521
Shapiro-Wilk 5% Critical Value	0.947
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3.555845

Gamma Distribution Test	
A-D Test Statistic	4.012807
A-D 5% Critical Value	0.794795
K-S Test Statistic	0.233124
K-S 5% Critical Value	0.13052
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.876151
Adjusted Gamma UCL	2.90227

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.926336
Shapiro-Wilk 5% Critical Value	0.947
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	2.225566
95% Chebyshev (MVUE) UCL	2.719651
97.5% Chebyshev (MVUE) UCL	3.222551
99% Chebyshev (MVUE) UCL	4.210401

95% Non-parametric UCLs	
CLT UCL	3.528827
Adj-CLT UCL (Adjusted for skewness)	4.37047
Mod-t UCL (Adjusted for skewness)	3.687124
Jackknife UCL	3.555845
Standard Bootstrap UCL	3.524857
Bootstrap-t UCL	7.979161
Hall's Bootstrap UCL	8.327693
Percentile Bootstrap UCL	3.75122
BCA Bootstrap UCL	5.3991
95% Chebyshev (Mean, Sd) UCL	5.842268
97.5% Chebyshev (Mean, Sd) UCL	7.449971
99% Chebyshev (Mean, Sd) UCL	10.60799

Data File

Variable: Silver (mg/kg dry)

Raw Statistics	
Number of Valid Samples	51
Number of Unique Samples	40
Minimum	0.05
Maximum	1580
Mean	35.36882
Median	1.66
Standard Deviation	220.9633
Variance	48824.78
Coefficient of Variation	6.247403
Skewness	7.107613

Gamma Statistics	
k hat	0.222656
k star (bias corrected)	0.22263
Theta hat	158.8498
Theta star	158.868
nu hat	22.71089
nu star	22.70829
Approx.Chi Square Value (.05)	12.86904
Adjusted Level of Significance	0.045294
Adjusted Chi Square Value	12.65277

Log-transformed Statistics	
Minimum of log data	-2.995732
Maximum of log data	7.36518
Mean of log data	0.316022
Standard Deviation of log data	1.957957
Variance of log data	3.833595

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

24.41795

Normal Distribution Test	
Lilliefors Test Statisitic	0.482751
Lilliefors 5% Critical Value	0.124065
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	87.22308

Gamma Distribution Test	
A-D Test Statistic	8.640791
A-D 5% Critical Value	0.89742
K-S Test Statistic	0.356059
K-S 5% Critical Value	0.137106
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	62.41068
Adjusted Gamma UCL	63.47742

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.119838
Lilliefors 5% Critical Value	0.124065
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	24.41795
95% Chebyshev (MVUE) UCL	23.10898
97.5% Chebyshev (MVUE) UCL	29.45645
99% Chebyshev (MVUE) UCL	41.92484

95% Non-parametric UCLs	
CLT UCL	86.26232
Adj-CLT UCL (Adjusted for skewness)	119.1667
Mod-t UCL (Adjusted for skewness)	92.3555
Jackknife UCL	87.22308
Standard Bootstrap UCL	86.26555
Bootstrap-t UCL	1685.858
Hall's Bootstrap UCL	1166.801
Percentile Bootstrap UCL	96.7349
BCA Bootstrap UCL	158.0621
95% Chebyshev (Mean, Sd) UCL	170.2377
97.5% Chebyshev (Mean, Sd) UCL	228.5956
99% Chebyshev (Mean, Sd) UCL	343.2284

Data File

Variable: Thallium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	51
Number of Unique Samples	40
Minimum	0.187
Maximum	12.9
Mean	1.549
Median	0.442
Standard Deviation	2.991453
Variance	8.948789
Coefficient of Variation	1.931215
Skewness	3.041055

Gamma Statistics	
k hat	0.737732
k star (bias corrected)	0.707408
Theta hat	2.099679
Theta star	2.189685
nu hat	75.24865
nu star	72.15559
Approx.Chi Square Value (.05)	53.59305
Adjusted Level of Significance	0.045294
Adjusted Chi Square Value	53.1276

Log-transformed Statistics	
Minimum of log data	-1.676647
Maximum of log data	2.557227
Mean of log data	-0.375666
Standard Deviation of log data	1.036748
Variance of log data	1.074847

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL
4.164949

Normal Distribution Test	
Lilliefors Test Statisitic	0.383274
Lilliefors 5% Critical Value	0.124065
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.251015

Gamma Distribution Test	
A-D Test Statistic	7.603973
A-D 5% Critical Value	0.794262
K-S Test Statistic	0.302164
K-S 5% Critical Value	0.129367
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.085513
Adjusted Gamma UCL	2.103784

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.231901
Lilliefors 5% Critical Value	0.124065
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.65773
95% Chebyshev (MVUE) UCL	2.027178
97.5% Chebyshev (MVUE) UCL	2.403612
99% Chebyshev (MVUE) UCL	3.143044

95% Non-parametric UCLs	
CLT UCL	2.238008
Adj-CLT UCL (Adjusted for skewness)	2.428605
Mod-t UCL (Adjusted for skewness)	2.280744
Jackknife UCL	2.251015
Standard Bootstrap UCL	2.229321
Bootstrap-t UCL	2.667961
Hall's Bootstrap UCL	2.226355
Percentile Bootstrap UCL	2.322235
BCA Bootstrap UCL	2.620039
95% Chebyshev (Mean, Sd) UCL	3.374887
97.5% Chebyshev (Mean, Sd) UCL	4.164949
99% Chebyshev (Mean, Sd) UCL	5.716875

Data File

Variable: Vanadium (mg/kg dry)

Raw Statistics	
Number of Valid Samples	49
Number of Unique Samples	48
Minimum	0.229
Maximum	980
Mean	65.85222
Median	35.2
Standard Deviation	144.3498
Variance	20836.85
Coefficient of Variation	2.192026
Skewness	5.637989

Gamma Statistics	
k hat	0.729173
k star (bias corrected)	0.698135
Theta hat	90.31084
Theta star	94.32589
nu hat	71.45895
nu star	68.41725
Approx.Chi Square Value (.05)	50.37515
Adjusted Level of Significance	0.045102
Adjusted Chi Square Value	49.90552

Log-transformed Statistics	
Minimum of log data	-1.474033
Maximum of log data	6.887553
Mean of log data	3.363276
Standard Deviation of log data	1.37347
Variance of log data	1.886421

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

271.0325

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.376677
Shapiro-Wilk 5% Critical Value	0.947
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	100.4389

Gamma Distribution Test	
A-D Test Statistic	2.674753
A-D 5% Critical Value	0.794409
K-S Test Statistic	0.211287
K-S 5% Critical Value	0.131883
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	89.43752
Adjusted Gamma UCL	90.27915

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.89582
Shapiro-Wilk 5% Critical Value	0.947
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	127.7727
95% Chebyshev (MVUE) UCL	150.4177
97.5% Chebyshev (MVUE) UCL	184.5275
99% Chebyshev (MVUE) UCL	251.5297

95% Non-parametric UCLs	
CLT UCL	99.7714
Adj-CLT UCL (Adjusted for skewness)	117.5184
Mod-t UCL (Adjusted for skewness)	103.2071
Jackknife UCL	100.4389
Standard Bootstrap UCL	99.8036
Bootstrap-t UCL	178.9879
Hall's Bootstrap UCL	214.2961
Percentile Bootstrap UCL	104.4327
BCA Bootstrap UCL	131.8251
95% Chebyshev (Mean, Sd) UCL	155.7388
97.5% Chebyshev (Mean, Sd) UCL	194.6328
99% Chebyshev (Mean, Sd) UCL	271.0325

Data File

Variable: Zinc (mg/kg dry)

Raw Statistics	
Number of Valid Samples	53
Number of Unique Samples	53
Minimum	8.28
Maximum	43200
Mean	2255.434
Median	952
Standard Deviation	6057.204
Variance	36689717
Coefficient of Variation	2.685605
Skewness	6.237831

Gamma Statistics	
k hat	0.563881
k star (bias corrected)	0.544542
Theta hat	3999.837
Theta star	4141.89
nu hat	59.77142
nu star	57.72147
Approx.Chi Square Value (.05)	41.25314
Adjusted Level of Significance	0.045472
Adjusted Chi Square Value	40.86361

Log-transformed Statistics	
Minimum of log data	2.113843
Maximum of log data	10.6736
Mean of log data	6.61516
Standard Deviation of log data	1.55041
Variance of log data	2.40377

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL
7451.403

Normal Distribution Test	
Lilliefors Test Statisitic	0.364768
Lilliefors 5% Critical Value	0.121701
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3648.81

Gamma Distribution Test	
A-D Test Statistic	2.075991
A-D 5% Critical Value	0.809207
K-S Test Statistic	0.177717
K-S 5% Critical Value	0.128565
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3155.806
Adjusted Gamma UCL	3185.89

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.179094
Lilliefors 5% Critical Value	0.121701
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4.66E+03
95% Chebyshev (MVUE) UCL	5333.673
97.5% Chebyshev (MVUE) UCL	6616.758
99% Chebyshev (MVUE) UCL	9137.129

95% Non-parametric UCLs	
CLT UCL	3623.986
Adj-CLT UCL (Adjusted for skewness)	4385.732
Mod-t UCL (Adjusted for skewness)	3767.627
Jackknife UCL	3648.81
Standard Bootstrap UCL	3632.505
Bootstrap-t UCL	6919.663
Hall's Bootstrap UCL	8180.313
Percentile Bootstrap UCL	3835.435
BCA Bootstrap UCL	4934.134
95% Chebyshev (Mean, Sd) UCL	5882.129
97.5% Chebyshev (Mean, Sd) UCL	7451.403
99% Chebyshev (Mean, Sd) UCL	10533.94

Data File

Variable: Carbazole (µg/kg dry)

Raw Statistics

Number of Valid Samples	38
Number of Unique Samples	27
Minimum	43
Maximum	25000
Mean	869.3684
Median	210
Standard Deviation	4021.797
Variance	16174854
Coefficient of Variation	4.626114
Skewness	6.15719

Gamma Statistics

k hat	0.460071
k star (bias corrected)	0.441293
Theta hat	1889.64
Theta star	1970.046
nu hat	34.9654
nu star	33.5383
Approx.Chi Square Value (.05)	21.29354
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	20.88843

Log-transformed Statistics

Minimum of log data	3.7612
Maximum of log data	10.12663
Mean of log data	5.369052
Standard Deviation of log data	0.976465
Variance of log data	0.953484

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL
3713.209

Normal Distribution Test

Shapiro-Wilk Test Statisitic	0.183947
Shapiro-Wilk 5% Critical Value	0.938

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1970.065

Gamma Distribution Test

A-D Test Statistic	9.388557
A-D 5% Critical Value	0.821636
K-S Test Statistic	0.432836
K-S 5% Critical Value	0.152191

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1369.295
Adjusted Gamma UCL	1395.851

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.683054
Shapiro-Wilk 5% Critical Value	0.938

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	504.7228
95% Chebyshev (MVUE) UCL	610.8813
97.5% Chebyshev (MVUE) UCL	728.248
99% Chebyshev (MVUE) UCL	958.7923

95% Non-parametric UCLs

CLT UCL	1942.507
Adj-CLT UCL (Adjusted for skewness)	2638.812
Mod-t UCL (Adjusted for skewness)	2078.674
Jackknife UCL	1970.065
Standard Bootstrap UCL	1950.737
Bootstrap-t UCL	32796.55
Hall's Bootstrap UCL	12212.67
Percentile Bootstrap UCL	2166.868
BCA Bootstrap UCL	2855.5
95% Chebyshev (Mean, Sd) UCL	3713.209
97.5% Chebyshev (Mean, Sd) UCL	4943.741
99% Chebyshev (Mean, Sd) UCL	7360.882

Data File

Variable: Dibenzofuran (mg/kg dry)

Raw Statistics	
Number of Valid Samples	40
Number of Unique Samples	27
Minimum	0.003
Maximum	16
Mean	0.6125
Median	
Standard Deviation	2.496914
Variance	6.234579
Coefficient of Variation	4.076594
Skewness	6.312172

Gamma Statistics	
k hat	0.573729
k star (bias corrected)	0.547366
Theta hat	1.067578
Theta star	1.118996
nu hat	45.8983
nu star	43.78926
Approx.Chi Square Value (.05)	29.61141
Adjusted Level of Significance	0.044
Adjusted Chi Square Value	29.17371

Log-transformed Statistics	
Minimum of log data	-5.809143
Maximum of log data	2.772589
Mean of log data	-1.574342
Standard Deviation of log data	1.064819
Variance of log data	1.13384

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL
4.540678

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.185628
Shapiro-Wilk 5% Critical Value	0.94
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.277683

Gamma Distribution Test	
A-D Test Statistic	9.355583
A-D 5% Critical Value	0.806036
K-S Test Statistic	0.413083
K-S 5% Critical Value	0.146787
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.905763
Adjusted Gamma UCL	0.919353

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.645142
Shapiro-Wilk 5% Critical Value	0.94
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.553866
95% Chebyshev (MVUE) UCL	0.66781
97.5% Chebyshev (MVUE) UCL	0.802109
99% Chebyshev (MVUE) UCL	1.065915

95% Non-parametric UCLs	
CLT UCL	1.261883
Adj-CLT UCL (Adjusted for skewness)	1.682903
Mod-t UCL (Adjusted for skewness)	1.343354
Jackknife UCL	1.277683
Standard Bootstrap UCL	1.245539
Bootstrap-t UCL	15.0296
Hall's Bootstrap UCL	6.537423
Percentile Bootstrap UCL	1.40085
BCA Bootstrap UCL	1.8275
95% Chebyshev (Mean, Sd) UCL	2.333379
97.5% Chebyshev (Mean, Sd) UCL	3.078005
99% Chebyshev (Mean, Sd) UCL	4.540678

Data File

Variable: Xylene isomers (total) (mg/kg dry)

Raw Statistics	
Number of Valid Samples	40
Number of Unique Samples	16
Minimum	0.0055
Maximum	110
Mean	3.3096125
Median	0.007
Standard Deviation	17.647452
Variance	311.43258
Coefficient of Variation	5.3321809
Skewness	5.989415

Gamma Statistics	
k hat	0.1388366
k star (bias corrected)	0.1450905
Theta hat	23.838189
Theta star	22.810677
nu hat	11.106926
nu star	11.60724
Approx.Chi Square Value (.05)	4.9685042
Adjusted Level of Significance	0.044
Adjusted Chi Square Value	4.8057923

Log-transformed Statistics	
Minimum of log data	-5.203007
Maximum of log data	4.7004804
Mean of log data	-4.400876
Standard Deviation of log data	1.9975383
Variance of log data	3.9901593

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

31.07282

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.202975
Shapiro-Wilk 5% Critical Value	0.94
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	8.010931

Gamma Distribution Test	
A-D Test Statistic	14.08182
A-D 5% Critical Value	0.939326
K-S Test Statistic	0.531579
K-S 5% Critical Value	0.156665
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	7.731797
Adjusted Gamma UCL	7.993576

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.38781
Shapiro-Wilk 5% Critical Value	0.94
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.292941
95% Chebyshev (MVUE) UCL	0.23256
97.5% Chebyshev (MVUE) UCL	0.299008
99% Chebyshev (MVUE) UCL	0.429531

95% Non-parametric UCLs	
CLT UCL	7.899259
Adj-CLT UCL (Adjusted for skewness)	10.72275
Mod-t UCL (Adjusted for skewness)	8.451339
Jackknife UCL	8.010931
Standard Bootstrap UCL	7.73032
Bootstrap-t UCL	4070.765
Hall's Bootstrap UCL	4178.167
Percentile Bootstrap UCL	8.808938
BCA Bootstrap UCL	13.75651
95% Chebyshev (Mean, Sd) UCL	15.47228
97.5% Chebyshev (Mean, Sd) UCL	20.73508
99% Chebyshev (Mean, Sd) UCL	31.07282

Data File

Variable: Toluene (mg/kg dry)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	18
Minimum	0.0022
Maximum	70
Mean	2.170374
Median	0.007
Standard Deviation	11.15524
Variance	124.4393
Coefficient of Variation	5.139775
Skewness	5.768917

Gamma Statistics	
k hat	0.145697
k star (bias corrected)	0.151036
Theta hat	14.89654
Theta star	14.36996
nu hat	12.5299
nu star	12.98905
Approx.Chi Square Value (.05)	5.884272
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	5.717901

Log-transformed Statistics	
Minimum of log data	-6.119298
Maximum of log data	4.248495
Mean of log data	-4.522586
Standard Deviation of log data	1.880795
Variance of log data	3.537391

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

19.09668

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.213995
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	5.03164

Gamma Distribution Test	
A-D Test Statistic	15.3172
A-D 5% Critical Value	0.938055
K-S Test Statistic	0.529369
K-S 5% Critical Value	0.151373
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	4.790926
Adjusted Gamma UCL	4.930325

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.397621
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.174626
95% Chebyshev (MVUE) UCL	0.158284
97.5% Chebyshev (MVUE) UCL	0.201915
99% Chebyshev (MVUE) UCL	0.287621

95% Non-parametric UCLs	
CLT UCL	4.96853
Adj-CLT UCL (Adjusted for skewness)	6.567664
Mod-t UCL (Adjusted for skewness)	5.281073
Jackknife UCL	5.03164
Standard Bootstrap UCL	4.96137
Bootstrap-t UCL	6553.403
Hall's Bootstrap UCL	3829.756
Percentile Bootstrap UCL	5.401651
BCA Bootstrap UCL	7.588328
95% Chebyshev (Mean, Sd) UCL	9.585549
97.5% Chebyshev (Mean, Sd) UCL	12.7941
99% Chebyshev (Mean, Sd) UCL	19.09668

Data File

Variable: Benz[a]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	38
Number of Unique Samples	33
Minimum	55
Maximum	62000
Mean	2179.237
Median	420
Standard Deviation	9992.008
Variance	99840221
Coefficient of Variation	4.585095
Skewness	6.116127

Gamma Statistics	
k hat	0.398736
k star (bias corrected)	0.384801
Theta hat	5465.36
Theta star	5663.284
nu hat	30.30395
nu star	29.24487
Approx.Chi Square Value (.05)	17.89825
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	17.52961

Log-transformed Statistics	
Minimum of log data	4.007333
Maximum of log data	11.03489
Mean of log data	6.03558
Standard Deviation of log data	1.220406
Variance of log data	1.48939

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

18307.16

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.203368
Shapiro-Wilk 5% Critical Value	0.938
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4913.876

Gamma Distribution Test	
A-D Test Statistic	6.739751
A-D 5% Critical Value	0.835259
K-S Test Statistic	0.352452
K-S 5% Critical Value	0.153417
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3560.766
Adjusted Gamma UCL	3635.648

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.866671
Shapiro-Wilk 5% Critical Value	0.938
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1496.415
95% Chebyshev (MVUE) UCL	1750.762
97.5% Chebyshev (MVUE) UCL	2139.58
99% Chebyshev (MVUE) UCL	2903.338

95% Non-parametric UCLs	
CLT UCL	4845.409
Adj-CLT UCL (Adjusted for skewness)	6563.816
Mod-t UCL (Adjusted for skewness)	5181.913
Jackknife UCL	4913.876
Standard Bootstrap UCL	4738.78
Bootstrap-t UCL	53980.14
Hall's Bootstrap UCL	23802.3
Percentile Bootstrap UCL	5394.921
BCA Bootstrap UCL	7211.184
95% Chebyshev (Mean, Sd) UCL	9244.653
97.5% Chebyshev (Mean, Sd) UCL	12301.86
99% Chebyshev (Mean, Sd) UCL	18307.16

Data File

Variable: Benzo[a]pyrene (mg/kg dry)

Raw Statistics	
Number of Valid Samples	40
Number of Unique Samples	31
Minimum	0.072
Maximum	52
Mean	1.832325
Median	0.38
Standard Deviation	8.16107
Variance	66.60306
Coefficient of Variation	4.453942
Skewness	6.264472

Gamma Statistics	
k hat	0.440142
k star (bias corrected)	0.423798
Theta hat	4.163029
Theta star	4.323578
nu hat	35.21138
nu star	33.90386
Approx.Chi Square Value (.05)	21.58539
Adjusted Level of Significance	0.044
Adjusted Chi Square Value	21.21614

Log-transformed Statistics	
Minimum of log data	-2.631089
Maximum of log data	3.951244
Mean of log data	-0.866752
Standard Deviation of log data	1.153907
Variance of log data	1.331502

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

14.67143

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.203251
Shapiro-Wilk 5% Critical Value	0.94
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	4.006451

Gamma Distribution Test	
A-D Test Statistic	6.679702
A-D 5% Critical Value	0.826456
K-S Test Statistic	0.338666
K-S 5% Critical Value	0.148721
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.878006
Adjusted Gamma UCL	2.928096

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.866007
Shapiro-Wilk 5% Critical Value	0.94
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.30966
95% Chebyshev (MVUE) UCL	1.561532
97.5% Chebyshev (MVUE) UCL	1.892562
99% Chebyshev (MVUE) UCL	2.542806

95% Non-parametric UCLs	
CLT UCL	3.954809
Adj-CLT UCL (Adjusted for skewness)	5.320498
Mod-t UCL (Adjusted for skewness)	4.219471
Jackknife UCL	4.006451
Standard Bootstrap UCL	3.888365
Bootstrap-t UCL	38.03678
Hall's Bootstrap UCL	14.82686
Percentile Bootstrap UCL	4.351
BCA Bootstrap UCL	5.866625
95% Chebyshev (Mean, Sd) UCL	7.456954
97.5% Chebyshev (Mean, Sd) UCL	9.890736
99% Chebyshev (Mean, Sd) UCL	14.67143

Data File

Variable: Benzo[b]fluoranthene (mg/kg dry)

Raw Statistics	
Number of Valid Samples	40
Number of Unique Samples	35
Minimum	0.074
Maximum	64
Mean	2.356875
Median	0.565
Standard Deviation	10.03896
Variance	100.7806
Coefficient of Variation	4.259435
Skewness	6.243396

Gamma Statistics	
k hat	0.445226
k star (bias corrected)	0.428501
Theta hat	5.293658
Theta star	5.50028
nu hat	35.61809
nu star	34.28007
Approx.Chi Square Value (.05)	21.88617
Adjusted Level of Significance	0.044
Adjusted Chi Square Value	21.51414

Log-transformed Statistics	
Minimum of log data	-2.60369
Maximum of log data	4.158883
Mean of log data	-0.595536
Standard Deviation of log data	1.234002
Variance of log data	1.52276

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

18.15029

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.213303
Shapiro-Wilk 5% Critical Value	0.94
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	5.031274

Gamma Distribution Test	
A-D Test Statistic	5.43344
A-D 5% Critical Value	0.825324
K-S Test Statistic	0.305936
K-S 5% Critical Value	0.148623
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3.691549
Adjusted Gamma UCL	3.755383

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.910886
Shapiro-Wilk 5% Critical Value	0.94
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.991185
95% Chebyshev (MVUE) UCL	2.339217
97.5% Chebyshev (MVUE) UCL	2.856676
99% Chebyshev (MVUE) UCL	3.873123

95% Non-parametric UCLs	
CLT UCL	4.967748
Adj-CLT UCL (Adjusted for skewness)	6.642035
Mod-t UCL (Adjusted for skewness)	5.292429
Jackknife UCL	5.031274
Standard Bootstrap UCL	4.938334
Bootstrap-t UCL	36.61206
Hall's Bootstrap UCL	16.44084
Percentile Bootstrap UCL	5.478525
BCA Bootstrap UCL	8.588975
95% Chebyshev (Mean, Sd) UCL	9.275748
97.5% Chebyshev (Mean, Sd) UCL	12.26955
99% Chebyshev (Mean, Sd) UCL	18.15029

Data File

Variable: Benzo[ghi]perylene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	38
Number of Unique Samples	31
Minimum	50
Maximum	19000
Mean	781.8421
Median	240
Standard Deviation	3046.794
Variance	9282954
Coefficient of Variation	3.896943
Skewness	6.093536

Gamma Statistics	
k hat	0.559013
k star (bias corrected)	0.532424
Theta hat	1398.611
Theta star	1468.457
nu hat	42.485
nu star	40.46425
Approx.Chi Square Value (.05)	26.88559
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	26.42621

Log-transformed Statistics	
Minimum of log data	3.912023
Maximum of log data	9.852194
Mean of log data	5.544627
Standard Deviation of log data	0.985264
Variance of log data	0.970745

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

2936.251

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.212851
Shapiro-Wilk 5% Critical Value	0.938
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1615.697

Gamma Distribution Test	
A-D Test Statistic	6.858493
A-D 5% Critical Value	0.807047
K-S Test Statistic	0.378038
K-S 5% Critical Value	0.150776
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1176.714
Adjusted Gamma UCL	1197.17

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.807946
Shapiro-Wilk 5% Critical Value	0.938
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	609.8375
95% Chebyshev (MVUE) UCL	737.7278
97.5% Chebyshev (MVUE) UCL	880.3304
99% Chebyshev (MVUE) UCL	1160.445

95% Non-parametric UCLs	
CLT UCL	1594.82
Adj-CLT UCL (Adjusted for skewness)	2116.866
Mod-t UCL (Adjusted for skewness)	1697.126
Jackknife UCL	1615.697
Standard Bootstrap UCL	1612.469
Bootstrap-t UCL	14302.96
Hall's Bootstrap UCL	5939.014
Percentile Bootstrap UCL	1767.474
BCA Bootstrap UCL	2353.553
95% Chebyshev (Mean, Sd) UCL	2936.251
97.5% Chebyshev (Mean, Sd) UCL	3868.465
99% Chebyshev (Mean, Sd) UCL	5699.62

Data File

Variable: Benzo[k]fluoranthene (µg/kg dry)

Raw Statistics

Number of Valid Samples	38
Number of Unique Samples	30
Minimum	44
Maximum	16000
Mean	703.4474
Median	245
Standard Deviation	2556.219
Variance	6534255
Coefficient of Variation	3.633845
Skewness	6.106922

Gamma Statistics

k hat	0.636119
k star (bias corrected)	0.603443
Theta hat	1105.842
Theta star	1165.723
nu hat	48.34507
nu star	45.86169
Approx.Chi Square Value (.05)	31.32194
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	30.82338

Log-transformed Statistics

Minimum of log data	3.78419
Maximum of log data	9.680344
Mean of log data	5.592933
Standard Deviation of log data	0.929241
Variance of log data	0.863489

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

2510.967

Normal Distribution Test

Shapiro-Wilk Test Statisitic	0.215094
Shapiro-Wilk 5% Critical Value	0.938

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1403.04

Gamma Distribution Test

A-D Test Statistic	6.717124
A-D 5% Critical Value	0.799572
K-S Test Statistic	0.341533
K-S 5% Critical Value	0.149972

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1029.99
Adjusted Gamma UCL	1046.65

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.799992
Shapiro-Wilk 5% Critical Value	0.938

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	588.0234
95% Chebyshev (MVUE) UCL	713.0839
97.5% Chebyshev (MVUE) UCL	845.5107
99% Chebyshev (MVUE) UCL	1105.637

95% Non-parametric UCLs

CLT UCL	1385.524
Adj-CLT UCL (Adjusted for skewness)	1824.477
Mod-t UCL (Adjusted for skewness)	1471.508
Jackknife UCL	1403.04
Standard Bootstrap UCL	1372.659
Bootstrap-t UCL	9719.718
Hall's Bootstrap UCL	4595.29
Percentile Bootstrap UCL	1507.737
BCA Bootstrap UCL	1960.632
95% Chebyshev (Mean, Sd) UCL	2510.967
97.5% Chebyshev (Mean, Sd) UCL	3293.082
99% Chebyshev (Mean, Sd) UCL	4829.396

Data File

Variable: Dibenz[a,h]anthracene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	38
Number of Unique Samples	29
Minimum	53
Maximum	1300
Mean	212.7237
Median	187.5
Standard Deviation	216.7167
Variance	46966.14
Coefficient of Variation	1.018771
Skewness	3.743633

Gamma Statistics	
k hat	1.925812
k star (bias corrected)	1.791318
Theta hat	110.4592
Theta star	118.7526
nu hat	146.3617
nu star	136.1401
Approx.Chi Square Value (.05)	110.1771
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	109.2107

Log-transformed Statistics	
Minimum of log data	3.970292
Maximum of log data	7.17012
Mean of log data	5.078437
Standard Deviation of log data	0.709537
Variance of log data	0.503443

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

262.8517

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.617301
Shapiro-Wilk 5% Critical Value	0.938
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	272.0353

Gamma Distribution Test	
A-D Test Statistic	0.97901
A-D 5% Critical Value	0.760286
K-S Test Statistic	0.124926
K-S 5% Critical Value	0.145111
Data follow approximate gamma distibution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	262.8517
Adjusted Gamma UCL	265.1775

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.954574
Shapiro-Wilk 5% Critical Value	0.938
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	263.2829
95% Chebyshev (MVUE) UCL	316.827
97.5% Chebyshev (MVUE) UCL	365.3026
99% Chebyshev (MVUE) UCL	460.5234

95% Non-parametric UCLs	
CLT UCL	270.5503
Adj-CLT UCL (Adjusted for skewness)	293.3633
Mod-t UCL (Adjusted for skewness)	275.5937
Jackknife UCL	272.0353
Standard Bootstrap UCL	269.1473
Bootstrap-t UCL	328.6166
Hall's Bootstrap UCL	533.0011
Percentile Bootstrap UCL	270.7895
BCA Bootstrap UCL	316.9342
95% Chebyshev (Mean, Sd) UCL	365.9656
97.5% Chebyshev (Mean, Sd) UCL	432.2734
99% Chebyshev (Mean, Sd) UCL	562.5224

Data File

Variable: Indeno[1,2,3-cd]pyrene (µg/kg dry)

Raw Statistics	
Number of Valid Samples	38
Number of Unique Samples	28
Minimum	45
Maximum	20000
Mean	815.5526
Median	245
Standard Deviation	3209.561
Variance	10301284
Coefficient of Variation	3.935443
Skewness	6.087256

Gamma Statistics	
k hat	0.552281
k star (bias corrected)	0.526224
Theta hat	1476.698
Theta star	1549.82
nu hat	41.97339
nu star	39.99303
Approx.Chi Square Value (.05)	26.50128
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	26.04543

Log-transformed Statistics	
Minimum of log data	3.806662
Maximum of log data	9.903488
Mean of log data	5.571155
Standard Deviation of log data	0.976583
Variance of log data	0.953714

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

3085.055

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.211674
Shapiro-Wilk 5% Critical Value	0.938
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1693.954

Gamma Distribution Test	
A-D Test Statistic	7.32119
A-D 5% Critical Value	0.8077
K-S Test Statistic	0.386712
K-S 5% Critical Value	0.150847
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1230.749
Adjusted Gamma UCL	1252.29

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.78666
Shapiro-Wilk 5% Critical Value	0.938
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	617.8797
95% Chebyshev (MVUE) UCL	747.8336
97.5% Chebyshev (MVUE) UCL	891.5243
99% Chebyshev (MVUE) UCL	1173.777

95% Non-parametric UCLs	
CLT UCL	1671.961
Adj-CLT UCL (Adjusted for skewness)	2221.33
Mod-t UCL (Adjusted for skewness)	1779.644
Jackknife UCL	1693.954
Standard Bootstrap UCL	1645.22
Bootstrap-t UCL	16005.63
Hall's Bootstrap UCL	6125.722
Percentile Bootstrap UCL	1831.316
BCA Bootstrap UCL	2397.026
95% Chebyshev (Mean, Sd) UCL	3085.055
97.5% Chebyshev (Mean, Sd) UCL	4067.071
99% Chebyshev (Mean, Sd) UCL	5996.05

Data File

Variable: Naphthalene (mg/kg dry)

Raw Statistics	
Number of Valid Samples	42
Number of Unique Samples	28
Minimum	0.009
Maximum	22
Mean	0.7957143
Median	0.2225
Standard Deviation	3.3632534
Variance	11.311473
Coefficient of Variation	4.2267098
Skewness	6.4128657

Gamma Statistics	
k hat	0.4948749
k star (bias corrected)	0.4753997
Theta hat	1.6079101
Theta star	1.6737796
nu hat	41.569488
nu star	39.933572
Approx.Chi Square Value (.05)	26.452818
Adjusted Level of Significance	0.0442857
Adjusted Chi Square Value	26.061308

Log-transformed Statistics	
Minimum of log data	-4.710531
Maximum of log data	3.0910425
Mean of log data	-1.51409
Standard Deviation of log data	1.179546
Variance of log data	1.3913288

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

5.959314

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.200396
Shapiro-Wilk 5% Critical Value	0.942
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.669063

Gamma Distribution Test	
A-D Test Statistic	7.793206
A-D 5% Critical Value	0.814422
K-S Test Statistic	0.371536
K-S 5% Critical Value	0.14436
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.201222
Adjusted Gamma UCL	1.219268

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.788822
Shapiro-Wilk 5% Critical Value	0.942
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.707494
95% Chebyshev (MVUE) UCL	0.84452
97.5% Chebyshev (MVUE) UCL	1.024131
99% Chebyshev (MVUE) UCL	1.376942

95% Non-parametric UCLs	
CLT UCL	1.64933
Adj-CLT UCL (Adjusted for skewness)	2.19804
Mod-t UCL (Adjusted for skewness)	1.75465
Jackknife UCL	1.669063
Standard Bootstrap UCL	1.617216
Bootstrap-t UCL	11.6771
Hall's Bootstrap UCL	7.019475
Percentile Bootstrap UCL	1.809119
BCA Bootstrap UCL	2.416357
95% Chebyshev (Mean, Sd) UCL	3.057814
97.5% Chebyshev (Mean, Sd) UCL	4.036626
99% Chebyshev (Mean, Sd) UCL	5.959314

Data File

Variable: 2-Methylnaphthalene (mg/kg dry)

Raw Statistics	
Number of Valid Samples	44
Number of Unique Samples	27
Minimum	0.007
Maximum	8.8
Mean	0.421659
Median	0.21
Standard Deviation	1.300155
Variance	1.690404
Coefficient of Variation	3.083428
Skewness	6.514163

Gamma Statistics	
k hat	0.757309
k star (bias corrected)	0.720826
Theta hat	0.556786
Theta star	0.584967
nu hat	66.64321
nu star	63.43268
Approx.Chi Square Value (.05)	46.10732
Adjusted Level of Significance	0.044545
Adjusted Chi Square Value	45.60596

Log-transformed Statistics	
Minimum of log data	-4.961845
Maximum of log data	2.174752
Mean of log data	-1.652997
Standard Deviation of log data	1.090402
Variance of log data	1.188976

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

2.371892

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.219475
Shapiro-Wilk 5% Critical Value	0.944
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.751159

Gamma Distribution Test	
A-D Test Statistic	7.035445
A-D 5% Critical Value	0.789219
K-S Test Statistic	0.345458
K-S 5% Critical Value	0.138572
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.580102
Adjusted Gamma UCL	0.58648

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.739182
Shapiro-Wilk 5% Critical Value	0.944
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.52118
95% Chebyshev (MVUE) UCL	0.631078
97.5% Chebyshev (MVUE) UCL	0.757097
99% Chebyshev (MVUE) UCL	1.004638

95% Non-parametric UCLs	
CLT UCL	0.74406
Adj-CLT UCL (Adjusted for skewness)	0.949735
Mod-t UCL (Adjusted for skewness)	0.78324
Jackknife UCL	0.751159
Standard Bootstrap UCL	0.736831
Bootstrap-t UCL	3.664593
Hall's Bootstrap UCL	2.518832
Percentile Bootstrap UCL	0.810318
BCA Bootstrap UCL	1.186841
95% Chebyshev (Mean, Sd) UCL	1.276029
97.5% Chebyshev (Mean, Sd) UCL	1.645715
99% Chebyshev (Mean, Sd) UCL	2.371892

Data File

Variable: Aroclor® 1242 (mg/kg dry)

Raw Statistics	
Number of Valid Samples	1
Number of Unique Samples	1
Minimum	0.79
Maximum	0.79
Mean	0.79
Median	0.79

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Data File

Variable: Aroclor® 1248 (mg/kg dry)

Raw Statistics

Number of Valid Samples	1
Number of Unique Samples	1
Minimum	4.4
Maximum	4.4
Mean	4.4
Median	4.4

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Data File

Variable: Aroclor® 1254 (mg/kg dry)

Raw Statistics

Number of Valid Samples	1
Number of Unique Samples	1
Minimum	0.55
Maximum	0.55
Mean	0.55
Median	0.55

Too Few Observations To Calculate UCLs

N<10, use detected maximum

Appendix E-7

Output for Surface Water

Data File

Variable: Lead (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	4
Minimum	2
Maximum	19
Mean	7.06
Median	4.2
Standard Deviation	6.816744
Variance	46.468
Coefficient of Variation	0.965544
Skewness	2.005073

Gamma Statistics	
k hat	1.827402
k star (bias corrected)	0.864294
Theta hat	3.863408
Theta star	8.168516
nu hat	18.27402
nu star	8.642941
Approx.Chi Square Value (.05)	3.112029
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	1.852076

Log-transformed Statistics	
Minimum of log data	0.693147
Maximum of log data	2.944439
Mean of log data	1.656542
Standard Deviation of log data	0.821419
Variance of log data	0.674729

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

19.60752

Use Mean for Lead Model

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.737534
Shapiro-Wilk 5% Critical Value	0.762
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	13.55902

Gamma Distribution Test	
A-D Test Statistic	0.486456
A-D 5% Critical Value	0.68512
K-S Test Statistic	0.293364
K-S 5% Critical Value	0.360884
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	19.60752
Adjusted Gamma UCL	32.94636

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.922879
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	40.37659
95% Chebyshev (MVUE) UCL	17.3691
97.5% Chebyshev (MVUE) UCL	21.94718
99% Chebyshev (MVUE) UCL	30.93995

95% Non-parametric UCLs	
CLT UCL	12.0744
Adj-CLT UCL (Adjusted for skewness)	14.99531
Mod-t UCL (Adjusted for skewness)	14.01462
Jackknife UCL	13.55902
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	20.34828
97.5% Chebyshev (Mean, Sd) UCL	26.09813
99% Chebyshev (Mean, Sd) UCL	37.3926

Data File

Variable: Manganese (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	141
Maximum	413
Mean	286.6
Median	365
Standard Deviation	132.0201
Variance	17429.3
Coefficient of Variation	0.460642
Skewness	-0.511608

Gamma Statistics	
k hat	4.907604
k star (bias corrected)	2.096375
Theta hat	58.39916
Theta star	136.7122
nu hat	49.07604
nu star	20.96375
Approx.Chi Square Value (.05)	11.5631
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	8.674092

Log-transformed Statistics	
Minimum of log data	4.94876
Maximum of log data	6.023448
Mean of log data	5.552759
Standard Deviation of log data	0.537833
Variance of log data	0.289264

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

412.4667

N<10, use detected max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.787684
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	412.4667

Gamma Distribution Test	
A-D Test Statistic	0.732345
A-D 5% Critical Value	0.680759
K-S Test Statistic	0.359969
K-S 5% Critical Value	0.358323
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	519.602
Adjusted Gamma UCL	692.6616

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.759303
Shapiro-Wilk 5% Critical Value	0.762
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	680.6769
95% Chebyshev (MVUE) UCL	588.7283
97.5% Chebyshev (MVUE) UCL	718.4349
99% Chebyshev (MVUE) UCL	973.2184

95% Non-parametric UCLs	
CLT UCL	383.7141
Adj-CLT UCL (Adjusted for skewness)	369.28
Mod-t UCL (Adjusted for skewness)	410.2153
Jackknife UCL	412.4667
Standard Bootstrap UCL	370.5515
Bootstrap-t UCL	415.6879
Hall's Bootstrap UCL	332.3786
Percentile Bootstrap UCL	375.8
BCA Bootstrap UCL	385.4
95% Chebyshev (Mean, Sd) UCL	543.9545
97.5% Chebyshev (Mean, Sd) UCL	655.312
99% Chebyshev (Mean, Sd) UCL	874.0522

Data File

Variable: Mercury (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	0.402
Maximum	17.6
Mean	5.02398
Median	0.7383
Standard Deviation	7.386487
Variance	54.56019
Coefficient of Variation	1.470246
Skewness	1.782639

Gamma Statistics	
k hat	0.594321
k star (bias corrected)	0.371062
Theta hat	8.453314
Theta star	13.53948
nu hat	5.943208
nu star	3.710616
Approx.Chi Square Value (.05)	0.610561
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	0.242516

Log-transformed Statistics	
Minimum of log data	-0.911303
Maximum of log data	2.867899
Mean of log data	0.573126
Standard Deviation of log data	1.650193
Variance of log data	2.723137

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

30.53267

Recommended UCL exceeds the maximum observation

N<10, use detected max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.737822
Shapiro-Wilk 5% Critical Value	0.762
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	12.06619

Gamma Distribution Test	
A-D Test Statistic	0.522474
A-D 5% Critical Value	0.706165
K-S Test Statistic	0.345347
K-S 5% Critical Value	0.369752
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	30.53267
Adjusted Gamma UCL	76.86931

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.863818
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4308.86
95% Chebyshev (MVUE) UCL	17.41511
97.5% Chebyshev (MVUE) UCL	22.98196
99% Chebyshev (MVUE) UCL	33.91697

95% Non-parametric UCLs	
CLT UCL	10.45749
Adj-CLT UCL (Adjusted for skewness)	13.27141
Mod-t UCL (Adjusted for skewness)	12.5051
Jackknife UCL	12.06619
Standard Bootstrap UCL	9.850229
Bootstrap-t UCL	225.3465
Hall's Bootstrap UCL	113.2802
Percentile Bootstrap UCL	10.75632
BCA Bootstrap UCL	12.88
95% Chebyshev (Mean, Sd) UCL	19.42289
97.5% Chebyshev (Mean, Sd) UCL	25.65332
99% Chebyshev (Mean, Sd) UCL	37.89177

Data File

Variable: Methyl mercury (ng/L unfiltered)

Raw Statistics	
Number of Valid Samples	5
Number of Unique Samples	5
Minimum	1.14
Maximum	2.77
Mean	2.01
Median	2.18
Standard Deviation	0.634468
Variance	0.40255
Coefficient of Variation	0.315656
Skewness	-0.38618

Gamma Statistics	
k hat	11.1761
k star (bias corrected)	4.603773
Theta hat	0.179848
Theta star	0.436598
nu hat	111.761
nu star	46.03773
Approx.Chi Square Value (.05)	31.46762
Adjusted Level of Significance	0.0086
Adjusted Chi Square Value	26.3137

Log-transformed Statistics	
Minimum of log data	0.131028
Maximum of log data	1.018847
Mean of log data	0.65273
Standard Deviation of log data	0.348744
Variance of log data	0.121622

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

2.614896

N<10, use detected max

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.973808
Shapiro-Wilk 5% Critical Value	0.762
Data are normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.614896

Gamma Distribution Test	
A-D Test Statistic	0.263054
A-D 5% Critical Value	0.678858
K-S Test Statistic	0.24594
K-S 5% Critical Value	0.357539
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.940668
Adjusted Gamma UCL	3.516641

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.940053
Shapiro-Wilk 5% Critical Value	0.762
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3.166306
95% Chebyshev (MVUE) UCL	3.380308
97.5% Chebyshev (MVUE) UCL	3.970754
99% Chebyshev (MVUE) UCL	5.130571

95% Non-parametric UCLs	
CLT UCL	2.476715
Adj-CLT UCL (Adjusted for skewness)	2.424354
Mod-t UCL (Adjusted for skewness)	2.606729
Jackknife UCL	2.614896
Standard Bootstrap UCL	2.430987
Bootstrap-t UCL	2.576283
Hall's Bootstrap UCL	2.381952
Percentile Bootstrap UCL	2.446
BCA Bootstrap UCL	2.326
95% Chebyshev (Mean, Sd) UCL	3.246806
97.5% Chebyshev (Mean, Sd) UCL	3.781973
99% Chebyshev (Mean, Sd) UCL	4.833206

Appendix E-8

Output for Groundwater

Data File

Variable: Arsenic (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	23
Minimum	1.12
Maximum	41.5
Mean	4.52
Median	2.45
Standard Deviation	7.323934
Variance	53.64001
Coefficient of Variation	1.620339
Skewness	3.696201

Gamma Statistics	
k hat	1.032072
k star (bias corrected)	0.975571
Theta hat	4.379538
Theta star	4.633184
nu hat	88.75822
nu star	83.89912
Approx.Chi Square Value (.05)	63.78438
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	63.17515

Log-transformed Statistics	
Minimum of log data	0.113329
Maximum of log data	3.725693
Mean of log data	0.951283
Standard Deviation of log data	0.889628
Variance of log data	0.791438

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

9.388408

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.497894
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.398555

Gamma Distribution Test	
A-D Test Statistic	5.085296
A-D 5% Critical Value	0.776936
K-S Test Statistic	0.357128
K-S 5% Critical Value	0.138766
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	5.945406
Adjusted Gamma UCL	6.00274

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.792573
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	5.228215
95% Chebyshev (MVUE) UCL	6.356324
97.5% Chebyshev (MVUE) UCL	7.463309
99% Chebyshev (MVUE) UCL	9.637766

95% Non-parametric UCLs	
CLT UCL	6.35712
Adj-CLT UCL (Adjusted for skewness)	7.029805
Mod-t UCL (Adjusted for skewness)	6.50348
Jackknife UCL	6.398555
Standard Bootstrap UCL	6.303014
Bootstrap-t UCL	7.869353
Hall's Bootstrap UCL	11.69144
Percentile Bootstrap UCL	6.641628
BCA Bootstrap UCL	8.102326
95% Chebyshev (Mean, Sd) UCL	9.388408
97.5% Chebyshev (Mean, Sd) UCL	11.49497
99% Chebyshev (Mean, Sd) UCL	15.63291

Data File

Variable: Barium (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	41
Minimum	10
Maximum	1100
Mean	341.1698
Median	338
Standard Deviation	240.6739
Variance	57923.93
Coefficient of Variation	0.705437
Skewness	1.021216

Gamma Statistics	
k hat	1.689153
k star (bias corrected)	1.586809
Theta hat	201.9768
Theta star	215.0037
nu hat	145.2672
nu star	136.4656
Approx.Chi Square Value (.05)	110.47
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	109.6587

Log-transformed Statistics	
Minimum of log data	2.302585
Maximum of log data	7.003065
Mean of log data	5.508061
Standard Deviation of log data	0.952524
Variance of log data	0.907303

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

421.4531

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.925733
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	402.9015

Gamma Distribution Test	
A-D Test Statistic	0.398764
A-D 5% Critical Value	0.764344
K-S Test Statistic	0.109221
K-S 5% Critical Value	0.13702
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	421.4531
Adjusted Gamma UCL	424.5712

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.916177
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	544.6145
95% Chebyshev (MVUE) UCL	662.5475
97.5% Chebyshev (MVUE) UCL	783.7106
99% Chebyshev (MVUE) UCL	1021.712

95% Non-parametric UCLs	
CLT UCL	401.5399
Adj-CLT UCL (Adjusted for skewness)	407.6473
Mod-t UCL (Adjusted for skewness)	403.8541
Jackknife UCL	402.9015
Standard Bootstrap UCL	399.5568
Bootstrap-t UCL	407.343
Hall's Bootstrap UCL	414.9497
Percentile Bootstrap UCL	402.0605
BCA Bootstrap UCL	432.3651
95% Chebyshev (Mean, Sd) UCL	501.1519
97.5% Chebyshev (Mean, Sd) UCL	570.3764
99% Chebyshev (Mean, Sd) UCL	706.3543

Data File

Variable: Cadmium (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	16
Minimum	0.11
Maximum	5.7
Mean	0.911674
Median	0.25
Standard Deviation	1.250599
Variance	1.563998
Coefficient of Variation	1.37176
Skewness	2.046028

Gamma Statistics	
k hat	0.781264
k star (bias corrected)	0.742261
Theta hat	1.166922
Theta star	1.228239
nu hat	67.18871
nu star	63.83446
Approx.Chi Square Value (.05)	46.4503
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	45.93474

Log-transformed Statistics	
Minimum of log data	-2.207275
Maximum of log data	1.740466
Mean of log data	-0.854516
Standard Deviation of log data	1.203887
Variance of log data	1.449343

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

2.80926

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.679566206
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1.232447151

Gamma Distribution Test	
A-D Test Statistic	3.301577274
A-D 5% Critical Value	0.787978583
K-S Test Statistic	0.309088069
K-S 5% Critical Value	0.140027925
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1.252871323
Adjusted Gamma UCL	1.266933226

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.85542117
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.419941543
95% Chebyshev (MVUE) UCL	1.692885552
97.5% Chebyshev (MVUE) UCL	2.055804559
99% Chebyshev (MVUE) UCL	2.768688674

95% Non-parametric UCLs	
CLT UCL	1.225371933
Adj-CLT UCL (Adjusted for skewness)	1.288955019
Mod-t UCL (Adjusted for skewness)	1.242364828
Jackknife UCL	1.232447151
Standard Bootstrap UCL	1.218071495
Bootstrap-t UCL	1.349353561
Hall's Bootstrap UCL	1.337644993
Percentile Bootstrap UCL	1.238
BCA Bootstrap UCL	1.37544186
95% Chebyshev (Mean, Sd) UCL	1.742979856
97.5% Chebyshev (Mean, Sd) UCL	2.102686383
99% Chebyshev (Mean, Sd) UCL	2.809260202

Data File

Variable: Copper (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	18
Minimum	0.75
Maximum	356
Mean	14.76209
Median	4.7
Standard Deviation	53.6812
Variance	2881.671
Coefficient of Variation	3.636422
Skewness	6.40801

Gamma Statistics	
k hat	0.529231
k star (bias corrected)	0.507812
Theta hat	27.89348
Theta star	29.07001
nu hat	45.51387
nu star	43.67182
Approx.Chi Square Value (.05)	29.51473
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	29.10963

Log-transformed Statistics	
Minimum of log data	-0.287682
Maximum of log data	5.874931
Mean of log data	1.502326
Standard Deviation of log data	1.276689
Variance of log data	1.629934

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

96.21481

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.231711
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	28.53107

Gamma Distribution Test	
A-D Test Statistic	4.157361
A-D 5% Critical Value	0.810513
K-S Test Statistic	0.348657
K-S 5% Critical Value	0.142328
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	21.8429
Adjusted Gamma UCL	22.14688

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.885388
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	17.18996
95% Chebyshev (MVUE) UCL	20.22184
97.5% Chebyshev (MVUE) UCL	24.72212
99% Chebyshev (MVUE) UCL	33.56204

95% Non-parametric UCLs	
CLT UCL	28.22737
Adj-CLT UCL (Adjusted for skewness)	36.77523
Mod-t UCL (Adjusted for skewness)	29.86436
Jackknife UCL	28.53107
Standard Bootstrap UCL	27.89291
Bootstrap-t UCL	128.3908
Hall's Bootstrap UCL	86.73631
Percentile Bootstrap UCL	31.05116
BCA Bootstrap UCL	39.76512
95% Chebyshev (Mean, Sd) UCL	50.44537
97.5% Chebyshev (Mean, Sd) UCL	65.88556
99% Chebyshev (Mean, Sd) UCL	96.21481

Data File

Variable: Manganese (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	42
Minimum	5
Maximum	6580
Mean	1416.472
Median	916
Standard Deviation	1470.999
Variance	2163837
Coefficient of Variation	1.038495
Skewness	1.578285

Gamma Statistics	
k hat	0.845547
k star (bias corrected)	0.802059
Theta hat	1675.214
Theta star	1766.045
nu hat	72.71702
nu star	68.97707
Approx.Chi Square Value (.05)	50.85614
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	50.31532

Log-transformed Statistics	
Minimum of log data	1.609438
Maximum of log data	8.79179
Mean of log data	6.559056
Standard Deviation of log data	1.522208
Variance of log data	2.317117

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

1921.186

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.81539
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	1793.776

Gamma Distribution Test	
A-D Test Statistic	0.403251
A-D 5% Critical Value	0.784933
K-S Test Statistic	0.106666
K-S 5% Critical Value	0.139686
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	1921.186
Adjusted Gamma UCL	1941.836

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.886991
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	4534.829
95% Chebyshev (MVUE) UCL	4963.691
97.5% Chebyshev (MVUE) UCL	6190.343
99% Chebyshev (MVUE) UCL	8599.863

95% Non-parametric UCLs	
CLT UCL	1785.454
Adj-CLT UCL (Adjusted for skewness)	1843.145
Mod-t UCL (Adjusted for skewness)	1802.775
Jackknife UCL	1793.776
Standard Bootstrap UCL	1779.5
Bootstrap-t UCL	1878.661
Hall's Bootstrap UCL	1880.421
Percentile Bootstrap UCL	1791.514
BCA Bootstrap UCL	1951.47
95% Chebyshev (Mean, Sd) UCL	2394.283
97.5% Chebyshev (Mean, Sd) UCL	2817.382
99% Chebyshev (Mean, Sd) UCL	3648.479

Data File

Variable: Mercury (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	46
Number of Unique Samples	40
Minimum	0.01084
Maximum	54.243
Mean	4.117653
Median	0.28245
Standard Deviation	10.19266
Variance	103.8903
Coefficient of Variation	2.475356
Skewness	3.598249

Gamma Statistics	
k hat	0.297038
k star (bias corrected)	0.292159
Theta hat	13.86237
Theta star	14.09389
nu hat	27.32751
nu star	26.87861
Approx.Chi Square Value (.05)	16.05575
Adjusted Level of Significance	0.044783
Adjusted Chi Square Value	15.78401

Log-transformed Statistics	
Minimum of log data	-4.524512
Maximum of log data	3.993474
Mean of log data	-0.909948
Standard Deviation of log data	2.229241
Variance of log data	4.969516

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

19.07058

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.472683
Shapiro-Wilk 5% Critical Value	0.945
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.641539

Gamma Distribution Test	
A-D Test Statistic	3.313015
A-D 5% Critical Value	0.863305
K-S Test Statistic	0.231367
K-S 5% Critical Value	0.141881
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	6.893282
Adjusted Gamma UCL	7.011958

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.935835
Shapiro-Wilk 5% Critical Value	0.945
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	17.80504
95% Chebyshev (MVUE) UCL	12.80741
97.5% Chebyshev (MVUE) UCL	16.57823
99% Chebyshev (MVUE) UCL	23.98529

95% Non-parametric UCLs	
CLT UCL	6.589581
Adj-CLT UCL (Adjusted for skewness)	7.441506
Mod-t UCL (Adjusted for skewness)	6.774422
Jackknife UCL	6.641539
Standard Bootstrap UCL	6.491595
Bootstrap-t UCL	8.606084
Hall's Bootstrap UCL	9.359974
Percentile Bootstrap UCL	6.720076
BCA Bootstrap UCL	8.493465
95% Chebyshev (Mean, Sd) UCL	10.66832
97.5% Chebyshev (Mean, Sd) UCL	13.5028
99% Chebyshev (Mean, Sd) UCL	19.07058

Data File

Variable: Methyl mercury (ng/L unfiltered)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	26
Minimum	0.12
Maximum	32.73
Mean	6.735926
Median	3.36
Standard Deviation	8.847301
Variance	78.27474
Coefficient of Variation	1.31345
Skewness	2.016914

Gamma Statistics	
k hat	0.679588
k star (bias corrected)	0.62877
Theta hat	9.91178
Theta star	10.71287
nu hat	36.69775
nu star	33.95355
Approx.Chi Square Value (.05)	21.6251
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	20.99551

Log-transformed Statistics	
Minimum of log data	-2.120264
Maximum of log data	3.488292
Mean of log data	1.014473
Standard Deviation of log data	1.560437
Variance of log data	2.434965

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

10.57607

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.711946
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	9.64002

Gamma Distribution Test	
A-D Test Statistic	0.34416
A-D 5% Critical Value	0.790537
K-S Test Statistic	0.135321
K-S 5% Critical Value	0.175792
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	10.57607
Adjusted Gamma UCL	10.89322

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.952863
Shapiro-Wilk 5% Critical Value	0.923
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	25.27302
95% Chebyshev (MVUE) UCL	22.53277
97.5% Chebyshev (MVUE) UCL	28.59662
99% Chebyshev (MVUE) UCL	40.5079

95% Non-parametric UCLs	
CLT UCL	9.536559
Adj-CLT UCL (Adjusted for skewness)	10.24274
Mod-t UCL (Adjusted for skewness)	9.750169
Jackknife UCL	9.64002
Standard Bootstrap UCL	9.440716
Bootstrap-t UCL	10.95548
Hall's Bootstrap UCL	10.9658
Percentile Bootstrap UCL	9.683704
BCA Bootstrap UCL	11.17963
95% Chebyshev (Mean, Sd) UCL	14.15767
97.5% Chebyshev (Mean, Sd) UCL	17.36906
99% Chebyshev (Mean, Sd) UCL	23.67722

Data File

Variable: Nickel (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	23
Minimum	0.55
Maximum	115
Mean	14.03023
Median	9.4
Standard Deviation	18.37444
Variance	337.6201
Coefficient of Variation	1.309632
Skewness	4.164974

Gamma Statistics	
k hat	0.912949
k star (bias corrected)	0.864759
Theta hat	15.36803
Theta star	16.22444
nu hat	78.51365
nu star	74.36928
Approx.Chi Square Value (.05)	55.50493
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	54.93861

Log-transformed Statistics	
Minimum of log data	-0.597837
Maximum of log data	4.744932
Mean of log data	2.001993
Standard Deviation of log data	1.288226
Variance of log data	1.659526

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

41.91054

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.571995
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	18.74319

Gamma Distribution Test	
A-D Test Statistic	1.429215
A-D 5% Critical Value	0.781739
K-S Test Statistic	0.194279
K-S 5% Critical Value	0.139328
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	18.79866
Adjusted Gamma UCL	18.99244

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.89246
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	28.97304
95% Chebyshev (MVUE) UCL	34.00081
97.5% Chebyshev (MVUE) UCL	41.61023
99% Chebyshev (MVUE) UCL	56.55748

95% Non-parametric UCLs	
CLT UCL	18.63924
Adj-CLT UCL (Adjusted for skewness)	20.54092
Mod-t UCL (Adjusted for skewness)	19.03981
Jackknife UCL	18.74319
Standard Bootstrap UCL	18.55296
Bootstrap-t UCL	22.54981
Hall's Bootstrap UCL	40.14555
Percentile Bootstrap UCL	19.12326
BCA Bootstrap UCL	18.42907
95% Chebyshev (Mean, Sd) UCL	26.2442
97.5% Chebyshev (Mean, Sd) UCL	31.52919
99% Chebyshev (Mean, Sd) UCL	41.91054

Data File

Variable: Thallium (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	15
Minimum	0.1
Maximum	13.5
Mean	2.063884
Median	2.2
Standard Deviation	2.378961
Variance	5.659458
Coefficient of Variation	1.152663
Skewness	2.79422

Gamma Statistics	
k hat	0.672784
k star (bias corrected)	0.641349
Theta hat	3.067678
Theta star	3.218035
nu hat	57.85939
nu star	55.15602
Approx.Chi Square Value (.05)	39.08656
Adjusted Level of Significance	0.044419
Adjusted Chi Square Value	38.61604

Log-transformed Statistics	
Minimum of log data	-2.302585
Maximum of log data	2.60269
Mean of log data	-0.178709
Standard Deviation of log data	1.648047
Variance of log data	2.716058

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

5.673581

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.711503
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	2.674076

Gamma Distribution Test	
A-D Test Statistic	3.613506
A-D 5% Critical Value	0.796823
K-S Test Statistic	0.26337
K-S 5% Critical Value	0.14094
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	2.912398
Adjusted Gamma UCL	2.947884

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.760134
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	7.26E+00
95% Chebyshev (MVUE) UCL	7.522459
97.5% Chebyshev (MVUE) UCL	9.463757
99% Chebyshev (MVUE) UCL	13.27706

95% Non-parametric UCLs	
CLT UCL	2.660617
Adj-CLT UCL (Adjusted for skewness)	2.825798
Mod-t UCL (Adjusted for skewness)	2.699841
Jackknife UCL	2.674076
Standard Bootstrap UCL	2.666486
Bootstrap-t UCL	2.971705
Hall's Bootstrap UCL	3.79756
Percentile Bootstrap UCL	2.672023
BCA Bootstrap UCL	3.055744
95% Chebyshev (Mean, Sd) UCL	3.645241
97.5% Chebyshev (Mean, Sd) UCL	4.329495
99% Chebyshev (Mean, Sd) UCL	5.673581

Data File

Variable: Vanadium (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	28
Number of Unique Samples	13
Minimum	0.8
Maximum	62.9
Mean	19.30357143
Median	25
Standard Deviation	14.7149831
Variance	216.5307275
Coefficient of Variation	0.762293296
Skewness	0.964656397

Gamma Statistics	
k hat	1.228012378
k star (bias corrected)	1.120249147
Theta hat	15.71936226
Theta star	17.23149844
nu hat	68.76869318
nu star	62.73395225
Approx.Chi Square Value (.05)	45.51129456
Adjusted Level of Significance	0.0404
Adjusted Chi Square Value	44.60383119

Log-transformed Statistics	
Minimum of log data	-0.223143551
Maximum of log data	4.141546164
Mean of log data	2.500787299
Standard Deviation of log data	1.181941185
Variance of log data	1.396984966

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

46.97288

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.804413
Shapiro-Wilk 5% Critical Value	0.924

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	24.0402

Gamma Distribution Test	
A-D Test Statistic	2.244144
A-D 5% Critical Value	0.768704
K-S Test Statistic	0.332119
K-S 5% Critical Value	0.169366

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	26.60854
Adjusted Gamma UCL	27.14989

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.81749
Shapiro-Wilk 5% Critical Value	0.924

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	45.29847
95% Chebyshev (MVUE) UCL	50.747
97.5% Chebyshev (MVUE) UCL	62.51102
99% Chebyshev (MVUE) UCL	85.61917

95% Non-parametric UCLs	
CLT UCL	23.8777
Adj-CLT UCL (Adjusted for skewness)	24.41939
Mod-t UCL (Adjusted for skewness)	24.12469
Jackknife UCL	24.0402
Standard Bootstrap UCL	23.81238
Bootstrap-t UCL	24.72418
Hall's Bootstrap UCL	25.32681
Percentile Bootstrap UCL	23.675
BCA Bootstrap UCL	23.15357
95% Chebyshev (Mean, Sd) UCL	31.4251
97.5% Chebyshev (Mean, Sd) UCL	36.6701
99% Chebyshev (Mean, Sd) UCL	46.97288

Data File

Variable: Benzene (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	10
Minimum	0.5
Maximum	140
Mean	9.303704
Median	5
Standard Deviation	26.45567
Variance	699.9027
Coefficient of Variation	2.843564
Skewness	4.992269

Gamma Statistics	
k hat	0.516507
k star (bias corrected)	0.483808
Theta hat	18.01275
Theta star	19.23014
nu hat	27.89136
nu star	26.12565
Approx.Chi Square Value (.05)	15.47432
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	14.94992

Log-transformed Statistics	
Minimum of log data	-0.693147
Maximum of log data	4.941642
Mean of log data	1.006805
Standard Deviation of log data	1.450236
Variance of log data	2.103185

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

59.96246

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.311361
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	17.98768

Gamma Distribution Test	
A-D Test Statistic	2.501062
A-D 5% Critical Value	0.805841
K-S Test Statistic	0.279346
K-S 5% Critical Value	0.177697
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15.70766
Adjusted Gamma UCL	16.25864

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.840752
Shapiro-Wilk 5% Critical Value	0.923
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	18.90091
95% Chebyshev (MVUE) UCL	18.24428
97.5% Chebyshev (MVUE) UCL	22.98651
99% Chebyshev (MVUE) UCL	32.30171

95% Non-parametric UCLs	
CLT UCL	17.67831
Adj-CLT UCL (Adjusted for skewness)	22.90508
Mod-t UCL (Adjusted for skewness)	18.80295
Jackknife UCL	17.98768
Standard Bootstrap UCL	17.33301
Bootstrap-t UCL	58.56831
Hall's Bootstrap UCL	49.26043
Percentile Bootstrap UCL	19.19259
BCA Bootstrap UCL	25.42593
95% Chebyshev (Mean, Sd) UCL	31.49659
97.5% Chebyshev (Mean, Sd) UCL	41.09947
99% Chebyshev (Mean, Sd) UCL	59.96246

Data File

Variable: Chlorobenzene (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	6
Minimum	1.9
Maximum	28
Mean	4.992593
Median	3
Standard Deviation	5.735244
Variance	32.89302
Coefficient of Variation	1.148751
Skewness	3.041558

Gamma Statistics	
k hat	1.634217
k star (bias corrected)	1.477329
Theta hat	3.055037
Theta star	3.379474
nu hat	88.24771
nu star	79.77574
Approx.Chi Square Value (.05)	60.19276
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	59.10508

Log-transformed Statistics	
Minimum of log data	0.641854
Maximum of log data	3.332205
Mean of log data	1.271807
Standard Deviation of log data	0.732062
Variance of log data	0.535914

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

9.803719

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.557089
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.875165

Gamma Distribution Test	
A-D Test Statistic	2.891198
A-D 5% Critical Value	0.761309
K-S Test Statistic	0.284283
K-S 5% Critical Value	0.171142
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	6.616872
Adjusted Gamma UCL	6.738638

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.774687
Shapiro-Wilk 5% Critical Value	0.923
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	6.368843
95% Chebyshev (MVUE) UCL	7.675071
97.5% Chebyshev (MVUE) UCL	9.00275
99% Chebyshev (MVUE) UCL	11.61072

95% Non-parametric UCLs	
CLT UCL	6.808097
Adj-CLT UCL (Adjusted for skewness)	7.498439
Mod-t UCL (Adjusted for skewness)	6.982844
Jackknife UCL	6.875165
Standard Bootstrap UCL	6.793359
Bootstrap-t UCL	8.689365
Hall's Bootstrap UCL	17.16919
Percentile Bootstrap UCL	6.962963
BCA Bootstrap UCL	7.922222
95% Chebyshev (Mean, Sd) UCL	9.803719
97.5% Chebyshev (Mean, Sd) UCL	11.8855
99% Chebyshev (Mean, Sd) UCL	15.97475

Data File

Variable: Chloroethane (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	2
Minimum	5
Maximum	20
Mean	6.25
Median	5
Standard Deviation	4.330127
Variance	18.75
Coefficient of Variation	0.69282
Skewness	3.464102

Gamma Statistics	
k hat	4.806439
k star (bias corrected)	3.660385
Theta hat	1.300339
Theta star	1.707471
nu hat	115.3545
nu star	87.84924
Approx.Chi Square Value (.05)	67.23727
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	64.49081

Log-transformed Statistics	
Minimum of log data	1.609438
Maximum of log data	2.995732
Mean of log data	1.724962
Standard Deviation of log data	0.400189
Variance of log data	0.160151

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL or Modified-t UCL

8.703189

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.327006818
Shapiro-Wilk 5% Critical Value	0.859
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	8.494855825

Gamma Distribution Test	
A-D Test Statistic	4.118909132
A-D 5% Critical Value	0.732729402
K-S Test Statistic	0.540784569
K-S 5% Critical Value	0.246020974
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	8.165972754
Adjusted Gamma UCL	8.513736159

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.327006818
Shapiro-Wilk 5% Critical Value	0.859
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	7.764191907
95% Chebyshev (MVUE) UCL	9.125412418
97.5% Chebyshev (MVUE) UCL	10.46164385
99% Chebyshev (MVUE) UCL	13.08641176

95% Non-parametric UCLs	
CLT UCL	8.306067035
Adj-CLT UCL (Adjusted for skewness)	9.641710142
Mod-t UCL (Adjusted for skewness)	8.703189158
Jackknife UCL	8.494855825
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/A
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	11.69862368
97.5% Chebyshev (Mean, Sd) UCL	14.0562475
99% Chebyshev (Mean, Sd) UCL	18.68734296

Data File Variable: 1,2-Dichloroethene isomers (total) (µg/L unfiltere

Raw Statistics	
Number of Valid Samples	12
Number of Unique Samples	3
Minimum	2
Maximum	45
Mean	8.083333
Median	5
Standard Deviation	11.65768
Variance	135.9015
Coefficient of Variation	1.442187
Skewness	3.428646

Gamma Statistics	
k hat	1.482883
k star (bias corrected)	1.167717
Theta hat	5.451095
Theta star	6.922337
nu hat	35.58918
nu star	28.02522
Approx.Chi Square Value (.05)	16.94577
Adjusted Level of Significance	0.02896
Adjusted Chi Square Value	15.64294

Log-transformed Statistics	
Minimum of log data	0.693147
Maximum of log data	3.806662
Mean of log data	1.716182
Standard Deviation of log data	0.709074
Variance of log data	0.502787

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL
22.75226

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.370756
Shapiro-Wilk 5% Critical Value	0.859
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	14.12699

Gamma Distribution Test	
A-D Test Statistic	3.321232
A-D 5% Critical Value	0.745894
K-S Test Statistic	0.517728
K-S 5% Critical Value	0.249617
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	13.36837
Adjusted Gamma UCL	14.48175

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.525405
Shapiro-Wilk 5% Critical Value	0.859
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	12.02017
95% Chebyshev (MVUE) UCL	13.46957
97.5% Chebyshev (MVUE) UCL	16.27867
99% Chebyshev (MVUE) UCL	21.7966

95% Non-parametric UCLs	
CLT UCL	13.61873
Adj-CLT UCL (Adjusted for skewness)	17.17778
Mod-t UCL (Adjusted for skewness)	14.68213
Jackknife UCL	14.12699
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	22.75226
97.5% Chebyshev (Mean, Sd) UCL	29.09952
99% Chebyshev (Mean, Sd) UCL	41.56747

Data File Variable: 1,4-Dichlorobenzene (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	4
Minimum	3
Maximum	200
Mean	19.76923
Median	5
Standard Deviation	54.15588
Variance	2932.859
Coefficient of Variation	2.739402
Skewness	3.604776

Gamma Statistics	
k hat	0.546141
k star (bias corrected)	0.471391
Theta hat	36.19803
Theta star	41.93812
nu hat	14.19967
nu star	12.25615
Approx.Chi Square Value (.05)	5.395197
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	4.762043

Log-transformed Statistics	
Minimum of log data	1.098612
Maximum of log data	5.298317
Mean of log data	1.836739
Standard Deviation of log data	1.050671
Variance of log data	1.10391

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

169.2177

Recommended UCL exceeds the detected max, use max (4 ug/L)

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.318683
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	46.53943

Gamma Distribution Test	
A-D Test Statistic	4.278324
A-D 5% Critical Value	0.786325
K-S Test Statistic	0.559203
K-S 5% Critical Value	0.249083
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	44.90934
Adjusted Gamma UCL	50.88041

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.408003
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	26.64073
95% Chebyshev (MVUE) UCL	24.39308
97.5% Chebyshev (MVUE) UCL	30.50464
99% Chebyshev (MVUE) UCL	42.50963

95% Non-parametric UCLs	
CLT UCL	44.47516
Adj-CLT UCL (Adjusted for skewness)	60.52094
Mod-t UCL (Adjusted for skewness)	49.04225
Jackknife UCL	46.53943
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	85.24049
97.5% Chebyshev (Mean, Sd) UCL	113.57
99% Chebyshev (Mean, Sd) UCL	169.2177

Data File

Variable: 4-Methylphenol (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	3
Minimum	2
Maximum	62
Mean	9.153846
Median	5
Standard Deviation	15.89993
Variance	252.8077
Coefficient of Variation	1.736967
Skewness	3.587678

Gamma Statistics	
k hat	1.177011
k star (bias corrected)	0.956675
Theta hat	7.777198
Theta star	9.568397
nu hat	30.60228
nu star	24.87355
Approx.Chi Square Value (.05)	14.51311
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	13.39588

Log-transformed Statistics	
Minimum of log data	0.693147
Maximum of log data	4.127134
Mean of log data	1.732623
Standard Deviation of log data	0.762732
Variance of log data	0.58176

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

28.37592

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.340799
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	17.01346

Gamma Distribution Test	
A-D Test Statistic	3.831002
A-D 5% Critical Value	0.754897
K-S Test Statistic	0.530841
K-S 5% Critical Value	0.242287
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15.68848
Adjusted Gamma UCL	16.99691

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.48511
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	13.03243
95% Chebyshev (MVUE) UCL	14.50943
97.5% Chebyshev (MVUE) UCL	17.60257
99% Chebyshev (MVUE) UCL	23.67843

95% Non-parametric UCLs	
CLT UCL	16.4074
Adj-CLT UCL (Adjusted for skewness)	21.09602
Mod-t UCL (Adjusted for skewness)	17.74479
Jackknife UCL	17.01346
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	28.37592
97.5% Chebyshev (Mean, Sd) UCL	36.69333
99% Chebyshev (Mean, Sd) UCL	53.03126

Data File

Variable: Toluene (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	4
Minimum	3
Maximum	1700
Mean	78.77778
Median	3
Standard Deviation	330.0199
Variance	108913.1
Coefficient of Variation	4.189251
Skewness	4.93063

Gamma Statistics	
k hat	0.265361
k star (bias corrected)	0.260568
Theta hat	296.8705
Theta star	302.3315
nu hat	14.32948
nu star	14.07065
Approx.Chi Square Value (.05)	6.618602
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	6.29288

Log-transformed Statistics	
Minimum of log data	1.098612
Maximum of log data	7.438384
Mean of log data	1.715625
Standard Deviation of log data	1.45283
Variance of log data	2.110714

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

710.7177

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.250518
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	187.1056

Gamma Distribution Test	
A-D Test Statistic	8.576456
A-D 5% Critical Value	0.867833
K-S Test Statistic	0.552708
K-S 5% Critical Value	0.183957
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	167.4756
Adjusted Gamma UCL	176.1442

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.431515
Shapiro-Wilk 5% Critical Value	0.923
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	38.6465
95% Chebyshev (MVUE) UCL	37.2398
97.5% Chebyshev (MVUE) UCL	46.92796
99% Chebyshev (MVUE) UCL	65.95849

95% Non-parametric UCLs	
CLT UCL	183.2463
Adj-CLT UCL (Adjusted for skewness)	247.6423
Mod-t UCL (Adjusted for skewness)	197.15
Jackknife UCL	187.1056
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	355.6217
97.5% Chebyshev (Mean, Sd) UCL	475.4123
99% Chebyshev (Mean, Sd) UCL	710.7177

Data File

Variable: Xylene isomers (total) (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	27
Number of Unique Samples	4
Minimum	3
Maximum	390
Mean	20.74074
Median	3
Standard Deviation	74.99107
Variance	5623.661
Coefficient of Variation	3.615641
Skewness	4.961381

Gamma Statistics	
k hat	0.452219
k star (bias corrected)	0.426664
Theta hat	45.86438
Theta star	48.61145
nu hat	24.41982
nu star	23.03984
Approx.Chi Square Value (.05)	13.11919
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	12.64045

Log-transformed Statistics	
Minimum of log data	1.098612
Maximum of log data	5.966147
Mean of log data	1.605222
Standard Deviation of log data	1.070972
Variance of log data	1.146981

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

164.3377

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.254099
Shapiro-Wilk 5% Critical Value	0.923
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	45.35628

Gamma Distribution Test	
A-D Test Statistic	7.76151
A-D 5% Critical Value	0.818303
K-S Test Statistic	0.525097
K-S 5% Critical Value	0.179039
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	36.42475
Adjusted Gamma UCL	37.80429

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.476149
Shapiro-Wilk 5% Critical Value	0.923
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	15.15513
95% Chebyshev (MVUE) UCL	17.46123
97.5% Chebyshev (MVUE) UCL	21.31287
99% Chebyshev (MVUE) UCL	28.87866

95% Non-parametric UCLs	
CLT UCL	44.47933
Adj-CLT UCL (Adjusted for skewness)	59.20343
Mod-t UCL (Adjusted for skewness)	47.65294
Jackknife UCL	45.35628
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	83.64854
97.5% Chebyshev (Mean, Sd) UCL	110.8688
99% Chebyshev (Mean, Sd) UCL	164.3377

Data File

Variable: Naphthalene (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	3
Minimum	5
Maximum	100
Mean	12.61538
Median	5
Standard Deviation	26.27907
Variance	690.5897
Coefficient of Variation	2.083097
Skewness	3.59451

Gamma Statistics	
k hat	0.899683
k star (bias corrected)	0.743346
Theta hat	14.02203
Theta star	16.97108
nu hat	23.39175
nu star	19.32699
Approx.Chi Square Value (.05)	10.35509
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	9.431355

Log-transformed Statistics	
Minimum of log data	1.609438
Maximum of log data	4.60517
Mean of log data	1.885093
Standard Deviation of log data	0.833271
Variance of log data	0.694341

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

44.38524

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.329316
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	25.60559

Gamma Distribution Test	
A-D Test Statistic	4.130352
A-D 5% Critical Value	0.76258
K-S Test Statistic	0.496944
K-S 5% Critical Value	0.24417
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	23.54566
Adjusted Gamma UCL	25.85179

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.389226
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	17.33704
95% Chebyshev (MVUE) UCL	18.64277
97.5% Chebyshev (MVUE) UCL	22.80988
99% Chebyshev (MVUE) UCL	30.99537

95% Non-parametric UCLs	
CLT UCL	24.60391
Adj-CLT UCL (Adjusted for skewness)	32.36793
Mod-t UCL (Adjusted for skewness)	26.81662
Jackknife UCL	25.60559
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	44.38524
97.5% Chebyshev (Mean, Sd) UCL	58.13208
99% Chebyshev (Mean, Sd) UCL	85.13508

Data File Variable: 2-Methylnaphthalene (µg/L unfiltered)

Raw Statistics	
Number of Valid Samples	13
Number of Unique Samples	3
Minimum	1
Maximum	200
Mean	19.38461538
Median	5
Standard Deviation	54.28863979
Variance	2947.25641
Coefficient of Variation	2.800604434
Skewness	3.600689262

Gamma Statistics	
k hat	0.484041755
k star (bias corrected)	0.423621863
Theta hat	40.0474033
Theta star	45.75924209
nu hat	12.58508564
nu star	11.01416844
Approx.Chi Square Value (.05)	4.58419467
Adjusted Level of Significance	0.03009
Adjusted Chi Square Value	4.009511284

Log-transformed Statistics	
Minimum of log data	0
Maximum of log data	5.298317367
Mean of log data	1.645592038
Standard Deviation of log data	1.250713791
Variance of log data	1.564284987

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

169.1995

Recommended UCL exceeds the detected max, use max (1 ug/L)

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.32964
Shapiro-Wilk 5% Critical Value	0.866
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	46.22045

Gamma Distribution Test	
A-D Test Statistic	3.414041
A-D 5% Critical Value	0.79313
K-S Test Statistic	0.526904
K-S 5% Critical Value	0.250331
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	46.57425
Adjusted Gamma UCL	53.24974

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.606629
Shapiro-Wilk 5% Critical Value	0.866
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	37.51047
95% Chebyshev (MVUE) UCL	27.47793
97.5% Chebyshev (MVUE) UCL	34.90155
99% Chebyshev (MVUE) UCL	49.4838

95% Non-parametric UCLs	
CLT UCL	44.15111
Adj-CLT UCL (Adjusted for skewness)	60.21799
Mod-t UCL (Adjusted for skewness)	48.72656
Jackknife UCL	46.22045
Standard Bootstrap UCL	N/R
Bootstrap-t UCL	N/R
Hall's Bootstrap UCL	N/R
Percentile Bootstrap UCL	N/R
BCA Bootstrap UCL	N/R
95% Chebyshev (Mean, Sd) UCL	85.01638
97.5% Chebyshev (Mean, Sd) UCL	113.4153
99% Chebyshev (Mean, Sd) UCL	169.1995

Appendix E-9

Output for Air Vapor

Data File

Variable: Mercury Vapor (ng/m³ dry)

Raw Statistics	
Number of Valid Samples	11
Number of Unique Samples	11
Minimum	1.42
Maximum	60.6
Mean	11.77545
Median	7.42
Standard Deviation	16.77956
Variance	281.5537
Coefficient of Variation	1.424961
Skewness	2.91622

Gamma Statistics	
k hat	1.015248
k star (bias corrected)	0.798968
Theta hat	11.5986
Theta star	14.73833
nu hat	22.33545
nu star	17.57729
Approx.Chi Square Value (.05)	9.084739
Adjusted Level of Significance	0.02783
Adjusted Chi Square Value	8.107435

Log-transformed Statistics	
Minimum of log data	0.350657
Maximum of log data	4.104295
Mean of log data	1.898475
Standard Deviation of log data	1.05364
Variance of log data	1.110157

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

22.78333

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.589675
Shapiro-Wilk 5% Critical Value	0.85
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	20.94511

Gamma Distribution Test	
A-D Test Statistic	0.536118
A-D 5% Critical Value	0.751265
K-S Test Statistic	0.203043
K-S 5% Critical Value	0.262299
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	22.78333
Adjusted Gamma UCL	25.52973

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.965356
Shapiro-Wilk 5% Critical Value	0.85
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	32.81617
95% Chebyshev (MVUE) UCL	26.80871
97.5% Chebyshev (MVUE) UCL	33.71628
99% Chebyshev (MVUE) UCL	47.28487

95% Non-parametric UCLs	
CLT UCL	20.09714
Adj-CLT UCL (Adjusted for skewness)	24.85037
Mod-t UCL (Adjusted for skewness)	21.68652
Jackknife UCL	20.94511
Standard Bootstrap UCL	19.6302
Bootstrap-t UCL	39.42976
Hall's Bootstrap UCL	51.79368
Percentile Bootstrap UCL	21.06545
BCA Bootstrap UCL	26.20909
95% Chebyshev (Mean, Sd) UCL	33.82812
97.5% Chebyshev (Mean, Sd) UCL	43.37033
99% Chebyshev (Mean, Sd) UCL	62.11414