

BASELINE HUMAN HEALTH

RISK ASSESSMENT

OPEN BURNING GROUND SOIL

**RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA**

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EXECUTIVE SUMMARY

Draper Aden Associates (DAA) performed this quantitative human health risk assessment of exposures to Open Burning Ground (OBG) site soil of site (industrial) workers at the Radford Army Ammunition Plant (RFAAP) located in Radford, Virginia. The assessment focuses on potential carcinogenic and non-carcinogenic health risks that may result from the ingestion, dermal contact, and inhalation of OBG soil.

Based on their review of the 2011 and 2012 OBG Soil Monitoring Annual Reports, the Virginia Department of Environmental Quality (DEQ) informed RFAAP in mid-2013 that a quantitative risk assessment would be required. While DEQ had not previously interpreted the relevant section (Section 3.2 of the Soil Monitoring Program) of the facility Permit this way, their 2013 reinterpretation of the relevant section concluded that a risk assessment was required. RFAAP did not concur with this reinterpretation. Subsequent discussions between RFAAP and DEQ concluded with an agreement that RFAAP would perform this one-time risk assessment using the most recent soil data per the agreed approach, in conjunction with the permit renewal. The agreed approach was memorialized in the facility's March 26, 2015 proposal letter and DEQ's April 29, 2015 approval letter (Appendix A).

This risk assessment was completed in general accordance DEQ's and U.S. EPA's risk assessment guidelines, as well is in accordance with the discussions and agreements between DEQ and RAAP, memorialized in key correspondences dated March 26, 2015, April 29, 2015 and August 21, 2015. DEQ-recommended risk assessment software, REAMS, was used to perform the risk assessment.

This risk assessment is a very conservative estimate of human health risk from exposure of site workers to site soil assuming complete exposure pathways that do not exist and are hypothetical and assuming similarly conservative exposure frequencies and duration which are likely an order of magnitude greater than the actual frequencies and duration of exposure. As such it serves as a conservative baseline estimate of risk.

This risk assessment evaluates existing data for several constituents of potential concern (COPCs) in soil including inorganics, volatile organic compounds, semi-volatile organic compounds, explosives, perchlorate, phthalates, and dibenzodioxins and dibenzofurans (i.e., dioxins/furans). Concentrations of detected constituents in OBG soil reported at or above the laboratory method detection limit (MDL) and the DEQ-recommended value for 3,3'-dimethylbenzidine were used in performing the risk assessment. To date, 3,3'-dimethylbenzidine has not been detected in OBG site soil.

The results of this risk assessment indicate the levels of COPCs detected or presumed in OBG soil do not exhibit carcinogenic or non-carcinogenic risks in excess of acceptable threshold limits. The results of this risk assessment indicate there are no individual hazard quotients or cumulative hazard indices that exceed the acceptable level of 1.0 for both individual COPCs and groups of COPCs. The cumulative excess cancer risks associated with OBG soil do not exceed 1 in 10,000 (10^{-4}) assuming 3,3'-dimethylbenzidine is present in site soil at 2.65 mg/kg, of which there is no evidence. The cumulative cancer risks associated with OBG soil do not exceed 1 in 100,000

(10^{-5}) assuming 3,3'-dimethylbenzidine is present in site soil at 0.265 mg/kg, of which there is no evidence.

As documented in the June 2015 proposed Annual Soil Monitoring Program under the permit renewal, it is the facility's understanding that this one-time risk assessment will serve as a baseline for evaluation of future Annual Soil Monitoring data. In general, the facility proposed with justification that no quantitative risk assessment of future soil monitoring data is required.

TABLE OF CONTENTS

1.0	INTRODUCTION & REASON FOR RISK ASSESSMENT	1
1.1	Risk Assessment Approach.....	1
1.2	Physical Site Description	2
1.3	General History and Land Use.....	3
1.4	Geologic Conditions of Site.....	3
1.5	Hydrogeologic Conditions of Site	3
2.0	RISK ASSESSMENT FRAMEWORK	4
2.1	Soil Monitoring Program	4
2.2	Risk Assessment Soil Data Locations.....	5
2.3	Development of Constituents of Potential Concern.....	5
2.4	Screening of Constituents of Potential Concern Applied to Risk Assessment.....	6
2.5	Summary of Constituents of Potential Concern Evaluated.....	7
3.0	HUMAN HEALTH EXPOSURE AND RISK ASSESSMENT.....	8
3.1	Site Conceptual Exposure Model.....	8
3.1.1	Sources of Impact and Receiving Media	8
3.1.2	Exposure Points and Routes.....	8
3.2	Exposure Point Concentrations.....	8
3.3	Estimated Chemical Intake Values and Exposure Concentrations	9
3.4	Toxicity Assessment	11
3.5	Risk Characterization.....	11
3.5.1	Individual Exposure Route and Constituents of Concern.....	11
3.6	Exposure Model Results	12
3.6.1	Individual Risks to Site Workers Exposed to OBG Soil	12
3.6.2	Cumulative Risks to Site Workers Exposed to OBG Soil	13
3.6.3	Uncertainty Analysis.....	13
3.6.4	Limitations of REAMS	13
4.0	CONCLUSIONS AND RECOMMENDATIONS	15
4.1	Conclusions.....	15
4.2	Recommendations and Future Evaluation	15
5.0	REFERENCES	17

TABLES

Table 1:	Soil Sample Analytical Results
Table 2:	Constituents of Concern and Exposure Point Concentrations (EPCs)
Table 3:	Receptor Exposure Parameters
Table 4:	Toxicity Values and Slope Factors
Table 5:	Individual Carcinogenic Risks and Hazard Quotient Estimates
Table 6:	Cumulative Carcinogenic Risks and Hazard Indices Estimates

FIGURES

Figure 1:	Site Location and Vicinity Map
Figure 2:	Soil Sample Locations

APPENDICES

Appendix A:	Relevant DEQ Correspondence & July 2014 Annual Soil Monitoring Event Analytical Summary
Appendix B:	ProUCL Exposure Point Concentration Calculation Input
Appendix C:	ProUCL Exposure Point Concentration Calculation Output
Appendix D:	REAMS Risk Assessment Exposure Model Output

1.0 INTRODUCTION & REASON FOR RISK ASSESSMENT

This document presents the Quantitative Human Health Risk Assessment of the Open Burning Ground (OBG; also known as Hazardous Waste Management Unit [HMWU] 13) site soil located at the Radford Army Ammunition Plant (RFAAP) in Radford, Virginia. This risk assessment evaluates the carcinogenic and non-carcinogenic risks to site (industrial) workers' exposure to soil at the OBG.

This risk assessment was conducted in accordance with DEQ's interpretation of the requirements specified in Section 3.2 of the Permit Attachment II.B-2 – *Soil Monitoring Program for the Open Burning Ground*, which is included in the *Final Permit for the Treatment of Hazardous Waste by Open Burning* (Final Permit; effective date October 28, 2005; modified September 27, 2011; and June 12, 2014). The June 12, 2014 Permit Modification updated the facility's Action Levels (ALs).

Based on their review of the 2011 and 2012 OBG Soil Monitoring Annual Reports, DEQ informed RFAAP in mid-2013 that a quantitative risk assessment would be required. DEQ informed RFAAP that a risk assessment must be performed on the most recent annual soil monitoring data because more than 10 non-carcinogenic constituents were observed at reportable concentrations and one chemical, nitroglycerin (NG), exceeded the "1/10 Action Level" in samples collected during several sampling events that occurred in 2011, 2012, and 2013. While DEQ had not interpreted the relevant section (Section 3.2 of Soil Monitoring Program) of the facility Permit this way, previously, from their reinterpretation in 2013 they concluded that a risk assessment was required. RFAAP did not concur with this reinterpretation. Subsequent discussions between RFAAP and DEQ concluded with an agreement that RFAAP would perform this one-time risk assessment using the most recent soil data per the agreed approach, in conjunction with the permit renewal. The agreed approach was memorialized in the facility's March 25, 2015 proposal letter and DEQ's April 29, 2015 approval letter.

Furthermore, it is the facility's understanding that this one-time risk assessment will serve as a baseline for evaluation of future Annual Soil Monitoring data. On June 3, 2015 the facility submitted to DEQ a proposed Annual Soil Monitoring Program under the permit renewal documents. In general, the facility proposed with justification that no quantitative risk assessment of future soil monitoring data is required.

1.1 Risk Assessment Approach

Per DEQ's April 29, 2015 approval letter (Appendix A), this risk assessment addresses data from the Annual Soil Monitoring Events and is not the risk assessment methodology of the closure plan with the facility's Hazardous Waste open burning treatment of the multi-pathway risk assessment requirements as dictated by the permit renewal process. This risk assessment methodology was developed from discussions between the facility and DEQ.

The following summarizes the key requirements of the risk assessment approach, as detailed in DEQ's April 29, 2015 letter shown in Appendix A:

- Compare soil data from the 2014 soil monitoring event to the most recent Action Levels detailed in the current hazardous waste permit. Do not include data that exceed Action Levels where interim measures have occurred to mitigate such exceedances. If more than 10 non-carcinogens are detected, compare soil data against the “1/10 Action Level.”
- Perform quantitative risk assessment for the industrial (composite) site worker if target non-carcinogens concentrations exceed the “1/10 Action Level” in one or more soil samples. The risk assessment will be limited to a human health risk assessment for site worker exposure to site soil for 250 days per year by the oral, dermal, and inhalation exposure routes. Treat the entire OBG area as a single unit.
- Perform the quantitative risk assessment in accordance with DEQ risk assessment guidelines using DEQ’s risk assessment software, REAMS. Apply standard default DEQ and USEPA Region 3 RSL risk assessment parameters as necessary.
- Perform the quantitative risk assessment for both carcinogens and non-carcinogens; include 3,3’-dimethylbenzidine per DEQ requirements.
- Treat the entire OBG as a single unit. Compute appropriate Upper Confidence Limits (UCLs) on detected soil concentrations for all applicable target constituents. Set UCLs as exposure point concentrations (EPCs).
- Compute individual and cumulative risks of exposure to multiple chemicals in soil through multiple exposure routes. Compare results to DEQ and USEPA standard default acceptable thresholds for cumulative risk, i.e. Hazard Quotient 1 and excess cumulative cancer risk of 1×10^{-4} . Should the cumulative risks not exceed these threshold levels, no further action will be required.
- Submit gridded, to-scale diagrams depicting all soil sampling locations and depths including samples making up composite samples.

1.2 Physical Site Description

RFAAP is located in the Valley and Ridge Physiographic Province in southwestern Virginia along the New River in Pulaski and Montgomery counties and is divided into two sections by the river. The southern section, which comprises two-thirds of the facility, is known as the Main Plant Area. The northern one-third of the property, which includes the OBG, is known as the Horseshoe Area.

As shown on Figure 1, the OBG is located within the 100-year floodplain of the New River at the southeastern end of the Horseshoe Area. The OBG is relatively flat and is located at approximate coordinates 37.192431°N and 80.524403°W, an approximate elevation of 1,695 feet above Mean Sea Level (MSL). The area slopes steeply upward 75 to 100 feet north of the unit.

1.3 General History and Land Use

The OBG serves as the waste propellant burning ground for the RFAAP facility. Material that cannot be burned in the Explosive Waste Incinerators is burned at the OBG.

1.4 Geologic Conditions of Site

The geology at RFAAP consists of the Cambrian-aged Elbrook Formation comprising limestone and dolomite with some shale and siltstone, covered by weathered residual deposits and/or alluvial deposits. The alluvial deposits have an average thickness of approximately 13 to 20 feet and consist of typical fluvial deposits of interbedded clay, silt, and sand/gravel deposits with lenses of cobbles. In portions of the site, the alluvial deposits and bedrock are separated by residual deposits, which consist of clay, silt, and clasts resulting from weathering of the parent bedrock. The residuum thickness on the site ranges from a few feet to up to 40 feet depending on the location.

The OBG is underlain by the Wheeling Silty Loam, which is characterized by low slopes. The unit includes a surface layer of approximately 10 inches of dark brown sandy loam underlain by 50 inches of dark brown gravelly sandy loam subsoil. At depths greater than 60 inches, the soil is predominantly a mixture of silt and sand with minor amounts of clay.

1.5 Hydrogeologic Conditions of Site

The general hydrogeologic setting for RFAAP is characterized by alluvial sediments overlying weathered and unweathered dolomite and limestone bedrock. In areas where alluvial sediments form the uppermost water-bearing zone, groundwater flow is generally from topographically high areas to topographically low areas. In some areas of the facility, the uppermost water-bearing zone is located within bedrock. Karst features within the bedrock aquifer can provide conduits for transport of groundwater to the New River, which is the discharge area for regional groundwater flow.

2.0 RISK ASSESSMENT FRAMEWORK

2.1 Soil Monitoring Program

The *Soil Monitoring Program for the Open Burning Ground (SMP)* was developed to monitor the OBG for potential effects to surface soil resulting from the facility operations. Implementation of the SMP will continue throughout the lifetime of the Resource Conservation & Recovery Act (RCRA) Operating Permit for the OBG facility. The SMP requires soil sampling at prescribed locations. Initially, the SMP required semiannual soil sampling; however, the sampling frequency was reduced from semiannual to annual monitoring as part of the Class 3 Permit Modification approved by the DEQ in correspondence dated September 27, 2011. The soil monitoring event for 2014 was conducted on July 31, 2014. Verification monitoring events occurred on September 18, 2014 and October 22, 2014. Hot Spot event sampling occurred on December 8, 2014.

As the SMP is designed to evaluate potential effects to the site by airborne deposition, soil sample collection targets the uppermost soil horizon. Sample locations were selected to represent the areas of greatest potential to be affected and are located between the burn pans of each burn pad. Each pad is defined as the area of raised topography that contains two individual burn pans. Burn pans are the ceramic or clay-lined vessels that hold waste propellant before and during the open burning process. The sample locations represent areas that are subject to overlapping zones of ejecta from each pan. The ejecta zone is conservatively defined as 20 feet in all directions based on previous studies. The actual sample locations correspond to areas of low topography between each pan that function as the runoff conduit for the pad. These areas are erosion channels that flow toward the river-side berm and to the pond that precedes Outfall 017. The channels are not vegetated.

In addition to the eight samples collected adjacent to the burn pans (PAD 1-8), two discreet grab samples (SB-1 and SB-2) were collected along the southern boundary of the OBG along the New River. Two samples (NB-1 and NB-2) were also collected in the grassed median north of the burn pads. In addition, one grab sample (BERM-1) was collected at the southeast corner of the OBG inside the berm, and one sample (POND-1) was collected at the bottom of the sediment basin. According to the facility permit, if no constituents are detected at the additional monitoring locations (SB-1, SB-2, NB-1, NB-2, BERM-1, and POND-1) above their respective Action Limits (ALs), RFAAP may petition DEQ to cease sampling at these additional locations. To date, no constituents have been detected at these additional monitoring locations at concentrations above their respective ALs.

In accordance with the SMP, the analytical results for the primary annual soil monitoring event conducted in July and subsequent follow-up/verification events for nitroglycerin performed in September, October, and December 2014 were compiled, evaluated and interpreted. to determine whether concentrations of COPCs in soil are greater than the designated ALs and 1/10 AL for non-carcinogens. Analytical results from the July, September, October, and December 2014 soil monitoring event were compared to the ALs updated in 2014 as approved by DEQ in the Class 1 Permit Modification dated June 12, 2014.

The analytical results of the July 2014 Annual Soil Monitoring event are presented in Appendix A.

2.2 Risk Assessment Soil Data Locations

This intent of this risk assessment is to evaluate risk based on the known, current levels of COPCs in OBG soil. The soil data used for this risk assessment was collected from the following locations during the 2014 sampling events. These sample locations (shown on Figure 2) are considered representative of current OBG soil conditions:

- BERM-1 • NB-1 • NB-2 • PAD-1 • PAD-2
- PAD-4 • PAD-5 • PAD-6 • PAD-7 • PAD-8
- POND-1 • SB-1 • SB-2 • PAD-3N • PAD-3S
- PAD-3E • PAD-3W

Per DEQ’s risk assessment approach, soil data from PAD-3 and the surrounding hotspot sampling locations are excluded from this risk assessment because these impacted soil were removed in 2015 and replaced with clean backfill; therefore, the area represented by this data no longer presents a risk to the site worker.

2.3 Development of Constituents of Potential Concern

The results of the data evaluation from the 2014 soil monitoring event are summarized in the 2014 Annual Soil Monitoring Report. A total of 26 target constituents were detected at concentrations equal to or greater than their respective laboratory method detection limits (MDL/DL) in the soil samples, as shown below.

COPC Detected Above MDL	Carcinogen	Non-Carcinogen
Arsenic	X	X
Chromium, Total	-	-
Chromium, VI	X	X
Diphenylamine	-	X
2,4-Dinitrotoluene	X	X
2,6-Dinitrotoluene	X	X
2,4,6-Trinitrotoluene	X	X
HMX	-	X
RDX	X	X
Nitroglycerin	X	X
Mercury	-	X
Diethyl phthalate	-	X
Dimethyl phthalate	-	-
Fluoranthene	-	X
Naphthalene	X	X
Benzo(a)anthracene	X	-
Bis(2-Ethylhexyl)phthalate	X	X

COPC Detected Above MDL	Carcinogen	Non-Carcinogen
Di-n-butyl phthalate	-	X
Lead	-	-
Selenium	-	X
Barium	-	X
Silver	-	X
Cadmium	-	X
Dioxin/Furans (2,3,7,8-TCDD)	X	X
Perchlorate	-	X
TPH-Diesel Range Organics (DRO)	X	X

The determination of whether a specific constituent is a carcinogen or a non-carcinogen is dependent upon that chemical's classification in the June 2015 USEPA Region 3 Regional Screening Level (RSL) Summary Table and/or its classification in the USEPA Integrated Risk Information System (IRIS; website www.epa.gov/IRIS/).

As specified in the Permit, if ten or more non-carcinogenic COPCs are detected during a single sampling event, the concentrations are compared to 1/10 the RSL of those constituents. This comparison is a qualitative evaluation that has no bearing on the risk evaluation of the site, and does not trigger corrective action or interim measures at the site.

Detected COPCs dimethyl phthalate and lead were not determined to be either carcinogenic or non-carcinogenic.

The constituent 3,3'-dimethylbenzidine was not detected in OBG soil above the MDL; however, in several cases the MDL exceeded the Action Limit. For this reason, the DEQ required using the value of 2.65 mg/kg as the exposure point concentration applied to this risk assessment.

2.4 Screening of Constituents of Potential Concern Applied to Risk Assessment

Though lead and dimethyl phthalate were detected in site soil and are considered COPCs, they are excluded from the risk assessment because neither of the constituents have defined toxicity parameters; therefore, risk calculations associated with these constituents cannot be performed.

TPH-DRO is also excluded because its toxicity parameters are not defined and also because it is not an individual chemical of concern associated with burn operations and air-borne deposition in soil at the OBG. The use of TPH toxicity parameters listed on EPA's Region 3 RSL Table is based on a single surrogate chemical constituent and therefore inappropriately and disproportionately affects the outcome of the risk assessment, and is not considered an accurate quantification of risk. Several of the actual chemical constituents that constitute TPH are part of the target constituent list for OBG, and therefore risks associated from those actual chemical constituents associated with TPH are already accounted for.

Several metals detected in soil above the MDL are excluded from the risk assessment because the detected concentrations did not exceed the facility-wide background concentration (FWBC). These metals are:

- Arsenic
- Barium
- Chromium
- Cadmium
- Chromium VI

2.5 Summary of Constituents of Potential Concern Evaluated

COPCs include applicable target constituents for which detections were observed on the July 31, 2014 annual soil monitoring event and whose UCLs/maximum detected concentrations do not exceed their FWBCs. Data collected from each sample location during this monitoring event was used with the exception of the nitroglycerin data for PAD-3. That hotspot has been further evaluated and the soil from that location and within a radius of 5 feet has been removed and disposed of offsite. Four independent soil samples spaced greater than 10 feet from each other were collected at PAD-3 for nitroglycerin during the verification event performed on October 22, 2014. These four sampling locations are outside of the hotspot area from which soil was eventually removed and disposed of offsite (in June 2015). This data consists of PAD-3N (29 mg/kg), PAD-3S (29.6 mg/kg), PAD-3E (9.64 mg/kg) and PAD-3W (2.69 mg/kg) and has been incorporated into this risk assessment.

COPCs evaluated in this risk assessment are those constituents that were detected at or above the method detection limit in at least one sample in OBG soil at levels greater than the FWBC during the 2014 sampling event that have associated carcinogenic or non-carcinogenic risk parameters on the USEPA Region 3 RSL Summary Table or DEQ's ACL Table. The COPCs evaluated as part of this risk assessment are:

- Diphenylamine
- 2,6-Dinitrotoluene
- RDX
- Diethyl phthalate
- Benz(a)anthracene
- Selenium
- Perchlorate
- 2,4,6-Trinitrotoluene
- Nitroglycerin
- Fluoranthene
- Bis(2-ethylhexyl)phthalate
- Silver
- 2,4-Dinitrotoluene
- HMX
- Mercury
- Naphthalene
- Di-n-butyl phthalate
- Dioxin/Furans

Though not detected in soil above the MDL, 3,3'-dimethylbenzidine is also evaluated in this risk assessment at DEQ's direction.

3.0 HUMAN HEALTH EXPOSURE AND RISK ASSESSMENT

This human health exposure and risk assessment evaluates the sources of potential human exposure, identifies transport mechanisms, primary receptors, exposure points and exposure routes at the Site; evaluates exposure pathways, and characterizes risk. The following risk assessment was conducted in accordance with USEPA and DEQ guidelines for the purpose of evaluating potential risks to human health posed by OBG soil.

3.1 Site Conceptual Exposure Model

The Site Conceptual Exposure Model (SCEM) depicts potential releases, exposure routes and actual and potential receptors who may be exposed via direct and indirect contact. In this risk assessment, the potential receptor is limited to the site worker with direct contact to site soil.

3.1.1 Sources of Impact and Receiving Media

The source of soil impact has been identified as a historical and on-going use, the open burning of waste propellants at the OBG. Soil data shown in Table 1 summarizes the detected concentrations in surface soil samples collected in 2014.

3.1.2 Exposure Points and Routes

Exposure points are locations where exposure could occur and exposure routes describe the basic mechanisms by which a chemical of concern may contact the body. Combined, the five elements of the site conceptual model (source, transport mechanism, receptors, exposure points, exposure routes) are referred to as the exposure pathway. All five elements of the exposure pathway must be present to be considered a complete exposure pathway. Receptors may be exposed to sources via multiple pathways depending on their activity patterns. This multiple pathway exposure is referred to as exposure scenario.

Exposure points on the site are assumed to be impacted soil that have the potential to be contacted by a human receptor. This risk assessment focuses on the exposure of site workers to OBG soil via primary exposure routes including incidental ingestion, dermal contact, and inhalation of particulates. The facility notes that such direct exposure to site soil by site workers is a practically non-existent scenario. RFAAP requires site workers operating at the OBG to don personnel protective equipment that effectively makes the exposure pathway incomplete and consequently eliminates any actual physical exposure of site workers to site soil. Therefore this risk assessment is a very conservative assessment of risks to human health. Actual risks are considered to be significantly lower than the calculated risks from this assessment.

3.2 Exposure Point Concentrations

Assuming its hypothetical existence, the complete exposure pathway evaluated in this risk assessment is the exposure of the site worker to COPC-impacted site soil via the primary exposure routes.

The concentrations of COPCs to which site workers are expected to be exposed is based on an estimate of the exposure point concentration (EPC) at the OBG. The EPC is the highest exposure

that is reasonably expected to occur at the OBG and is calculated by combining upper-end estimates of exposure parameters with a conservative estimate of the mean/median concentration to which receptors will be exposed. For this risk assessment, the conservative estimate of the mean/median concentration of each COPC detected in soil is typically the 95 percent upper confidence limit (95UCL) calculated on the mean concentration. The 95UCL for each COPC was calculated using the statistical method recommended by ProUCL for the data set based on the properties of the underlying data. The resulting 95UCL for each COPC is the EPC. In certain cases ProUCL recommends a different UCL which has been used. If the 95UCL cannot be adequately calculated, the maximum detected concentration conservatively serves as the EPC.

Using the data sets for OBG soil including non-detects (Appendix B ProUCL Input), data for each COPC was entered into USEPA's ProUCL 5.0 software to calculate the exposure point concentration UCL for each COPC. Each piece of data in each data set is either the quantified total concentration of the COPC in soil (identified with a "1" in Appendix B) or is assumed to be equal to the method detection limit if the concentration was too low to be accurately quantified (i.e. "non-detect", identified with a "0" in Appendix B). In some cases where an elevated MDL was observed, an average MDL is used. For example, the chemical bis(2-ethylhexyl)phthalate was detected in five of 13 soil samples. Of the eight non-detect values reported at the MDL (generally ranging from 0.067 mg/kg to 0.086 mg/kg), two MDL values were reported at 0.37 and 0.7. Since these MDLs were abnormally high relative to the majority of the MDL values, they were replaced by the average MDL (shown in italics in Appendix B) calculated using the six other MDL values.

The calculated EPCs are shown in Table 2 and the ProUCL output for each COPC data set is presented in Appendix C. The calculated EPC for each COPC is used as the input soil concentration in the REAMS exposure model.

The EPC for 3,3'-dimethylbenzidine is the DEQ-recommended value of 2.65 mg/kg (half the highest elevated detection limit due to sample dilutions). For comparison purposes, this risk assessment uses both 2.65 mg/kg and 0.265 mg/kg as the EPC for 3,3'-dimethylbenzidine. The risk assessment also evaluates site soil assuming 3,3'-dimethylbenzidine is not present.

3.3 Estimated Chemical Intake Values and Exposure Concentrations

Exposure to COPCs was evaluated using the DEQ's REAMS software and USEPA Risk Assessment Guidance for Superfund (RAGS). As shown in Table 3, the exposure parameters applied to the intake equations are the most recently recommended USEPA default values for the site worker and/or outdoor site worker soil exposure scenario or the most recent REAMS default values. The exposure parameters can be referenced in the USEPA Risk Assessment Guidance for Superfund (RAGS) Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (2014).

To calculate risk according to individual exposure routes (ingestion, dermal, inhalation), the chronic daily intake (mg/kg-day) is first calculated for each COPC for each exposure route for the site worker. According to RAGS and REAMs, the approach for calculating ingestion exposure involves the application of the estimated EPC for each COPC to an intake equation that uses the site worker exposure parameters based on the ingestion exposure route. In this risk assessment, the chronic daily intake equation for ingestion of soil is:

$$Intake, Ing \left(\frac{mg}{kg - day} \right) = \frac{(CS)(IR)(CF)(EF)(ED)}{(AT)(BW)}$$

Where:

CS = Chemical concentration in soil; 95UCL or max detection of COPC (mg/kg)

IR = Ingestion Rate (mg/day)

CF = Conversion Factor, 1×10^{-6} (kg/mg)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (days)

For dermal exposure, the calculation for chronic daily intake is very similar to ingestion though the dermal exposure intake equation accounts for skin surface area, fraction of skin exposed, and a chemical-specific absorption factor. In this risk assessment, the chronic daily intake equation for dermal absorption is:

$$Intake, Derm \left(\frac{mg}{kg - day} \right) = \frac{(CS)(CF)(ABS)(EF)(ED * SA * AF)}{(BW)(AT)}$$

Where:

CS = Chemical concentration in soil; 95UCL or max detection of COPC (mg/kg)

CF = Conversion Factor, 1×10^{-6} (kg/mg)

SA = Skin surface area (cm²)

AF = Adherence Factor (mg/cm²)

ABS = Absorption Fraction (unitless)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (days)

For inhalation exposure, the calculation for the exposure concentration uses a particulate emission factor (PEF) and a chemical-specific volatilization factor (VF) to calculate the exposure

concentration in air. In this risk assessment, the equation to calculate the exposure concentration to constituents in air is:

$$\text{Exposure Concentration, Inh} \left(\frac{\mu\text{g}}{\text{m}^3} \right) = \frac{(CS)(ET)(EF)(ED) \left(\left(\frac{1}{VF} \right) + \left(\frac{1}{PEF} \right) \right) * CF}{(AT)}$$

Where:

CS = Chemical concentration in soil; 95UCL or max detection of COPC (mg/kg)

ET = Exposure Time (hr/hr)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

VF = Volatilization Factor (m³/kg)

PEF = Particulate Emission Factor (m³/kg)

AT = Averaging Time (days)

CF = Conversion Factor, 1x10³ (μg/mg)

The estimated exposure concentrations for the ingestion, dermal, and inhalation pathways are applied to cancer risk and non-cancer hazard equations using the appropriate carcinogenic slope factors and toxicity values to calculate the estimated daily intake of COPCs.

3.4 Toxicity Assessment

Carcinogenic slope factors and toxicity values, as shown in Table 4, are chemical-specific parameters used to calculate carcinogenic risks and non-carcinogenic hazard indices. For this risk assessment, the most recent values used in the exposure model were derived from the 2015 Region 3 RSL Table, the IRIS website, or the default REAMs value.

3.5 Risk Characterization

3.5.1 Individual Exposure Route and Constituents of Concern

For risk characterization, individual exposure routes are quantitatively evaluated by applying receptor-specific (site worker) chemical intake values to the cancer risk and non-cancer hazard equations in the REAMs software package. Using the input values, REAMs calculates the potential risk for each COPC for each exposure route (ingestion, dermal, inhalation) for the site worker.

The equations for calculating the cancer risk for each of the three individual exposure routes are as follows:

$$\text{Ingestion Cancer Risk} = \text{Oral Intake} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right) \times \text{Oral Slope Factor} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right)^{-1}$$

$$\text{Dermal Cancer Risk} = \text{Dermal Intake} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right) \times \text{Dermal Slope Factor} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right)^{-1}$$

$$\text{Inhalation Risk} = \text{Exposure Concentration} \left(\frac{\mu\text{g}}{\text{m}^3} \right) \times \text{Unit Inhalation Risk} \left(\frac{\mu\text{g}}{\text{m}^3} \right)^{-1}$$

The equations for calculating non-cancer hazard quotients (HQ) for individual exposure routes are as follows:

$$\text{Ingestion HQ} = \frac{\text{Ingestion Intake} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right)}{\text{Oral Reference Dose} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right)}$$

$$\text{Dermal HQ} = \frac{\text{Dermal Intake} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right)}{\text{Dermal Reference Dose} \left(\frac{\text{mg}}{\text{kg} - \text{day}} \right)}$$

$$\text{Inhalation HQ} = \frac{\text{Exposure Concentration} (\mu\text{g}/\text{m}^3)}{\text{Toxicity Value} \left(\frac{\text{mg}}{\text{m}^3} \right) \times 1000 \mu\text{g}/\text{mg}}$$

3.6 Exposure Model Results

3.6.1 Individual Risks to Site Workers Exposed to OBG Soil

Cancer risks and non-cancer hazard quotients (HQs) for the site worker exposed to each individual exposure route were calculated by REAMS with software output and results presented in Appendix D. The calculated individual cancer risks and HQs are summarized in Table 5.

Except for 3,3'-dimethylbenzidine, the results of the individual risk calculations indicate cancer risks of less than 1×10^{-6} across all individual exposure routes for all COPCs. The results of the non-cancer hazard quotient calculations indicate HQs of less than 1.0 for all receptors across all individual exposure routes for all COPCs.

3.6.2 Cumulative Risks to Site Workers Exposed to OBG Soil

It is presumed site workers will be exposed to soil containing all COPCs; therefore, cumulative risks associated with soil and exposure route (ingestion, dermal, inhalation) is calculated by summing the risks associated with each COPC. The cumulative risks for each exposure route are shown in Table 6. The sum risk associated with all exposure routes is the total pathway risk.

Assuming the 3,3'-dimethylbenzidine EPC is 2.65 mg/kg in OBG soil, the total pathway cancer risk for site workers exposed to OBG soil is 1.38×10^{-5} and the total hazard index is 0.263.

If it is assumed the 3,3'-dimethylbenzidine EPC is 0.265 mg/kg in OBG soil, the total pathway risk for site workers exposed to OBG soil is 2.47×10^{-6} and the total hazard index is 0.263.

If it is assumed the 3,3'-dimethylbenzidine does not exist in OBG soil, the total pathway risk for site workers exposed to OBG soil is 1.21×10^{-6} and the total hazard index is 0.263.

3.6.3 Uncertainty Analysis

This risk assessment presents conservative estimates of potential risks associated with exposure to COPCs in OBG soil. Uncertainty is inherent in the risk assessment process and is discussed in this section. Each of the three basic building blocks for risk assessment (monitoring data, exposure scenarios, and toxicity values) contribute uncertainties, each of which is accounted for by using conservative assumptions when specific data are unavailable.

Overall, the assumptions made in this analysis are likely to lead to a significant overestimation of risk to the average receptor at the site, rather than an underestimate. The risk estimates reported in this risk assessment combine upper-end exposure assumptions and conservative estimates of the exposure point concentrations (95% UCL).

In this risk assessment, overestimation of risk is also driven by the presumed 2.65 mg/kg EPC for 3,3'-dimethylbenzidine. At this concentration, 3,3'-dimethylbenzidine is the only COPC with an individual cancer risk estimate greater than 1×10^{-6} .

This risk assessment may also underestimate risk, presumably by a negligible amount, by excluding exposure to dimethyl phthalate and lead. Both of these constituents were detected in OBG soil; however, neither of these constituents have defined toxicity values, therefore, calculating risk using the methodology presented in this risk assessment is not feasible.

3.6.4 Limitations of REAMS

The REAMS software is the recommended tool for evaluating potential risk and was used for this OBG soil risk assessment. During the course of the developing the exposure model, several limitations were observed:

- Naphthalene, a COPC in OBG soil, is considered both a carcinogen and a non-carcinogen; therefore, it is run in the REAMS model as “both” in the “Type” column of the Media Parameters tab. Naphthalene is only considered a carcinogen for the inhalation exposure route, not for dermal or ingestion. As a non-carcinogen, naphthalene is considered toxic

via all exposure routes. REAMS requires all columns to be populated to run the risk analysis for all exposure routes as both carcinogen and non-carcinogen. Since naphthalene does not have an oral slope factor, a value must be substituted in this cell for the REAMS model to run. For this risk assessment, the RFD_{oral} value of 0.02 mg/kg-day was used as the oral slope factor to make the model run. The resulting cancer risk for the ingestion exposure route computed to 1×10^{-10} ; a negligible amount.

- Similarly, for 2,4-dinitrotoluene and bis(2-ethylhexyl)phthalate, there are no $RfC_{inhalation}$ values available for these constituents. Both constituents are run in the REAMS model as carcinogenic and non-carcinogenic, and both constituents have an Inhalation Unit Risk Factor (IUR) so the inhalation route must be evaluated. Since there are no $RfC_{inhalation}$ values associated with these constituents, values must be substituted to make the model run. In these cases, a disproportionately high number (1,000 mg/kg-day) is substituted to force the calculated hazard quotient to be low since there is no data with the inhalation exposure route for these constituents. The resulting hazard associated with the inhalation route computes to a negligible amount.
- The oral reference dose (RFD_{oral}) for dioxins as TCDD-2,3,7,8 is 7×10^{-10} mg/kg-day; however, the lowest value able to be entered into this cell in REAMS is 1×10^{-8} mg/kg-day. The resulting hazard quotient for dioxins computes as two orders of magnitude lower than if the true oral reference dose was applied to the model; however, the difference relative to the cumulative hazard index is negligible.
- REAMS output indicates the standard default value for the volatilization factor (VF) applied to the inhalation of particulates via soil is 0.5; however, hand calculations indicate this value is not used by the model. Only chemical-specific values for VF are used by the model.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Based on their review of the 2011 and 2012 OBG Soil Monitoring Annual Reports, the DEQ required RFAAP to perform a quantitative risk assessment of OBG soil. While DEQ had not previously interpreted the relevant section (Section 3.2 of Soil Monitoring Program) of the facility Permit this way, their 2013 reinterpretation of the Section 3.2 concluded that a risk assessment was required. RFAAP did not concur with this reinterpretation; however, RFAAP subsequently agreed to perform this one-time risk assessment using the most recent soil data (at that time the most recent data was from July 2014) per the agreed approach, in conjunction with the permit renewal. The agreed approach was memorialized in the facility's March 26, 2015 proposal letter and DEQ's April 29, 2015 approval letter.

This risk assessment was completed in general accordance DEQ's and U.S. EPA's risk assessment guidelines, as well is in accordance with the discussions and agreements between DEQ and RAAP, memorialized in key correspondences dated March 26, 2015, April 29, 2015 and August 21, 2015. DEQ-recommended risk assessment software, REAMS, was used to perform the risk assessment.

This risk assessment evaluated the risks associated with constituents of potential concern detected in OBG soil during the July 2014 annual soil monitoring event. The analytical soil data were input into ProUCL to quantify the exposure point concentrations for the site worker. The 95UCLs or alternative UCL recommended by ProUCL for detected constituents were applied to the REAMS exposure model as the exposure point concentration along with applicable DEQ/USEPA standard default risk assessment parameters to calculate the estimated daily intake by the site worker of each COPC by each exposure route (ingestion, dermal, inhalation).

The results of this risk assessment for individual COPCs indicate excess lifetime cancer risks do not exceed 1 in 100,000 (1×10^{-5}) for OBG soil, except for 3,3'-dimethylbenzidine (only when using the extremely conservative value of 2.65 mg/kg as the EPC, as required by DEQ). The hazard quotients calculated to quantify appreciable risk of non-carcinogens did not exceed one (1.0) for any individual or group of COPCs.

The total pathway cumulative excess cancer risks posed by multiple COPCs and exposure routes do not exceed one in ten-thousand (1×10^{-4}) for the site worker exposure scenario. The hazard index for non-carcinogenic effects (sum of hazard quotients for multiple COPCs and exposure routes) does not exceed 1.0.

Overall, the levels of COPCs detected in OBG soil do not exhibit unacceptable levels of carcinogenic or non-carcinogenic effects when evaluated using a conservative model. The only COPC in OBG soil that exceeded an excess lifetime cancer risk of 1 in 100,000 is 3,3'-dimethylbenzidine which is a constituent that has never been detected in site soil.

4.2 Recommendations and Future Evaluation

Overall, cumulative risks do not exceed threshold levels; therefore, per the approach detailed by DEQ, no further action is required.

The results of this risk assessment indicate that cumulative risks and hazards associated with observed concentrations of COPCs in OBG soil are an order of magnitude below the recommended risk threshold. For example, if it is assumed that 3,3'-dimethylbenzidine is not present in site soil (or at levels less than 1 mg/kg; which is supported by the data), the cumulative cancer risk does not exceed 1 in 100,000.

As previously noted this risk assessment is a very conservative estimate of human health risk from exposure of site workers to site soil assuming complete exposure pathways that do not exist and are hypothetical and assuming similarly conservative exposure frequencies and duration which are likely an order of magnitude greater than the actual frequencies and duration of exposure. As such it serves as a very conservative baseline estimate of risk.

The results of this risk assessment provide a baseline for the interpretation of future OBG annual soil monitoring data. In accordance with the agreement between BAE and DEQ, this is a one-time risk assessment which will serve as a baseline for evaluation of future Annual Soil Monitoring data. On June 3, 2015 the facility submitted to DEQ a proposed Annual Soil Monitoring Program under the permit renewal documents. In general, the facility proposed with justification that no quantitative risk assessment of future soil monitoring data is required. Furthermore, the soil monitoring data from 2015 and the historical soil monitoring data is consistent with the 2014 soil monitoring data on which this baseline risk assessment was performed.

5.0 REFERENCES

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USEPA Region 3 Region Screening Level (RSL) Composite Worker Soil Table, June 2015.

Tables

**Table 1 - Open Burning Ground Soil Concentration Data (Detected Constituents Only)
July 31, 2014 Sampling Event**

Sample Location ID	Detected Constituent Concentrations in Soil (mg/kg)										
	Arsenic	Chromium, total	Chromium, hexavalent	Diphenylamine	Perchlorate	2,4-Dinitrotoluene	2,6 Dinitrotoluene	2,4,6 Trinitrotoluene	HMX		
BERM-1	1.8	14	NS	0.12 J	NS	0.083 U	NS	0.083 U	0.21 U		
NB-1	1.6	15	NS	0.2 J	NS	0.0986 U	NS	0.131 J	0.0986 U		
NB-2	1.3	12	NS	0.17 J	NS	0.0989 U	NS	0.0989 U	0.224 J		
PAD-1	1.4	13	0.28 U	0.073 J	0.00102 U	0.249	0.418	0.101 U	0.101 U		
PAD-2	2.2	35	0.74 J	0.034 U	0.00102 U	0.104 U	0.104 U	0.104 U	0.104 U		
PAD-4	2	16	0.3 U	0.56 J	0.00491	3.18	0.0986 U	0.0986 U	0.836		
PAD-5	1.6	13	0.28 U	0.038 J	0.00756	0.433	0.102 U	0.102 U	0.102 U		
PAD-6	0.88	30	1.6	1.7 J	0.00621	0.0966 U	0.0966 U	0.0966 U	0.0966 U		
PAD-7	1.9	13	0.29 U	0.17 J	0.00181 J	0.0973 U	0.0973 U	0.0973 U	0.0973 U		
PAD-8	1.4	13	0.28 U	0.074 J	0.00101 U	0.0996 U	0.0996 U	0.0996 U	0.0996 U		
POND-1	1.7	13	NS	0.098 J	NS	2.28	NS	0.327	0.101 U		
SB-1	2.1	19	NS	0.043 U	NS	0.0964 U	NS	0.0964 U	0.0964 U		
SB-2	2.2	21	NS	0.079 J	NS	0.103 U	NS	0.527	0.103 U		
PAD-3N	NS	NS	NS	NS	NS	NS	NS	NS	NS		
PAD-3S	NS	NS	NS	NS	NS	NS	NS	NS	NS		
PAD-3E	NS	NS	NS	NS	NS	NS	NS	NS	NS		
PAD-3W	NS	NS	NS	NS	NS	NS	NS	NS	NS		

Notes:

- J flag denotes concentration is above method detection limit but below laboratory reporting limit
- U flag denotes concentration is below method detection limit; value is reported as method detection limit
- NS - Not Sampled
- PAD-3 data is not shown because impacted soils have been removed and properly disposed.
- Samples PAD-3N, PAD-3S, PAD-3E, and PAD-3W were collected October 22, 2014 beyond the extents of soil removal and only analyzed for target analyte nitroglycerin.
- July 31, 2014 Soil Monitoring Event data is detailed in Appendix A.

**Table 1 - Open Burning Ground Soil Concentration Data (Detected Constituents Only)
July 31, 2014 Sampling Event**

Sample Locatoin ID	Detected Constituent Concentrations in Soil (mg/kg)								
	RDX	Nitroglycerin	Mercury	Diethyl phthalate	Dimethyl phthalate	Fluoranthene	Naphthalene	Benzo(a) - anthracene	
BERM-1	NS	14	NS	0.068 U	0.068 U	NS	NS	NS	
NB-1	NS	1.98	NS	1.2	0.33	NS	NS	NS	
NB-2	NS	0.741 J	NS	0.65	0.075 U	NS	NS	NS	
PAD-1	0.101 U	23.1	0.016 U	0.068 U	0.068 U	0.003 U	0.003 U	0.003 U	
PAD-2	0.104 U	9.17	0.016 U	0.068 U	0.068 U	0.005 J	0.003 U	0.005 J	
PAD-4	5.28	17.5	0.017 U	0.42 J	0.37 U	0.029 J	0.034 J	0.027 J	
PAD-5	0.102 U	11.1	0.027 J	0.068 U	0.068 U	0.006 J	0.005 J	0.003 U	
PAD-6	0.0966 U	53.1	0.019 J	0.78 J	0.7 U	0.076 J	0.035 U	0.035 U	
PAD-7	0.0973 U	20.2	0.016 U	0.17 J	0.07 U	0.005 J	0.007 J	0.003 U	
PAD-8	0.0996 U	13.2	0.015 U	0.067 U	0.15 J	0.004 J	0.003 U	0.003 U	
POND-1	NS	8.66	NS	0.36	0.069 U	NS	NS	NS	
SB-1	NS	0.0964 U	NS	0.086 U	0.086 U	NS	NS	NS	
SB-2	NS	0.103 U	NS	0.51	0.09 U	NS	NS	NS	
PAD-3N	NS	29	NS	NS	NS	NS	NS	NS	
PAD-3S	NS	29.6	NS	NS	NS	NS	NS	NS	
PAD-3E	NS	9.64	NS	NS	NS	NS	NS	NS	
PAD-3W	NS	2.69	NS	NS	NS	NS	NS	NS	

Notes:

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- NS - Not Sampled
- PAD-3 data is not shown because impacted soils have been removed and properly disposed.
- Samples PAD-3N, PAD-3S, PAD-3E, and PAD-3W were collected October 22, 2014 beyond the extents of soil removal and only analyzed for target analyte nitroglycerin.
- July 31, 2014 Soil Monitoring Event data is detailed in Appendix A.

**Table 1 - Open Burning Ground Soil Concentration Data (Detected Constituents Only)
July 31, 2014 Sampling Event**

Sample Location ID	Detected Constituent Concentrations in Soil (mg/kg)									
	bis (2-Ethylhexyl) phthalate	Di-n-butyl phthalate	Lead	Selenium	Barium	Silver	Cadmium	Dioxin (ng/mg)	TPH-Diesel	
BERM-1	0.082 J	2.1	120	0.42 U	81	NS	0.16 J	1.5	NS	
NB-1	0.7	0.99	240	0.47 U	110	NS	0.43 J	6.35	NS	
NB-2	0.34	0.54	210	0.52 U	100	NS	0.2 J	3.18	NS	
PAD-1	0.31	0.32	38	0.41 U	89	0.11 J	0.12 J	0.43	4.2 U	
PAD-2	0.068 U	0.12 J	160	0.46 U	120	0.29 J	0.23 J	1.71	NS	
PAD-4	0.37 U	1.1	270	0.46 U	140	0.15 J	0.27 J	10.07	190	
PAD-5	0.068 U	0.19	150	0.41 J	140	0.11 J	0.11 J	1.44	NS	
PAD-6	0.7 U	20	610	0.44 U	92	0.098 U	0.16 J	2.61	NS	
PAD-7	0.07 U	0.48	81	0.43 U	100	0.096 U	0.11 J	1.7	8.4 J	
PAD-8	0.067 U	0.43	110	0.42 U	80	0.11 J	0.059 J	0.49	NS	
POND-1	0.069 U	0.4	86	0.4 U	92	NS	0.14 J	1.9	NS	
SB-1	0.086 U	0.086 U	54	0.52 U	100	NS	0.23 J	1.82	NS	
SB-2	0.47	2.4	120	0.58 U	120	NS	0.39 J	5.12	NS	
PAD-3N	NS	NS	NS	NS	NS	NS	NS	NS	NS	
PAD-3S	NS	NS	NS	NS	NS	NS	NS	NS	NS	
PAD-3E	NS	NS	NS	NS	NS	NS	NS	NS	NS	
PAD-3W	NS	NS	NS	NS	NS	NS	NS	NS	NS	

Notes:

- J flag denotes concentration is above method detection limit but below laboratory reporting limit
- U flag denotes concentration is below method detection limit; value is reported as method detection limit
- NS - Not Sampled
- PAD-3 data is not shown because impacted soils have been removed and properly disposed.
- Samples PAD-3N, PAD-3S, PAD-3E, and PAD-3W were collected October 22, 2014 beyond the extents of soil removal and only analyzed for target analyte nitroglycerin.
- July 31, 2014 Soil Monitoring Event data is detailed in Appendix A.

Table 2 - Open Burning Ground Constituents of Potential Concern and Exposure Point Concentrations

Detected Constituents	Frequency of Detections (Number of Detects/Number of Samples)	Maximum Soil Concentration (mg/kg)	UCL/Exposure Point Concentration (mg/kg)	Rationale	COPC?	Notes
Arsenic	13/13	2.2	1.892	95% Student's-t UCL	No	See Note 5
Chromium, Total	13/13	35	21.04	95% Student's-t UCL	No	See Note 11
Chromium, VI	2/7	1.6	1.015	95% KM (t) UCL	No	See Note 6
Diphenylamine	11/13	1.7	1.052	97.5% Chebyshev (Mean, Sd) UCL	Yes	
2,4-Dinitrotoluene	4/13	3.18	1.078	95% KM (t) UCL	Yes	
2,6-Dinitrotoluene	1/7	0.418	0.418	Max Detected	Yes	EPC is max detection
2,4,6-Trinitrotoluene	3/13	0.527	0.218	95% KM (t) UCL	Yes	
HMX	2/13	0.836	0.301	95% KM (t) UCL	Yes	Substituted average DL (0.09995) for one elevated dilution DL (0.21)
RDX	1/7	5.28	5.28	Max Detected	Yes	EPC is max detection
Nitroglycerin	15/17	53.1	20.21	95% KM (t) UCL	Yes	See Note 4
Mercury	2/7	0.27000	0.0216	95% KM (t) UCL	Yes	See Note 12
Diethyl phthalate	7/13	1.2	0.529	95% KM (t) UCL	Yes	
Dimethyl phthalate	2/13	0.33	0.144	95% KM (t) UCL	Yes	Substituted average DL (0.073556) for two elevated dilution DLs (0.37 and 0.7)
Fluoranthene	6/7	0.076	0.083	97.5% Chebyshev (Mean, Sd) UCL	Yes	
Naphthalene	3/7	0.034	0.0178	95% KM (t) UCL	Yes	Substituted average DL (0.003) for elevated one dilution DL (0.035)
Benzo(a)anthracene	2/7	0.027	0.027	Max Detected	Yes	Substituted average DL (0.003) for elevated one dilution DL (0.035), EPC is max detection
bis(2-Ethylhexyl)phthalate	5/13	0.47	0.297	95% KM (t) UCL	Yes	Substituted average DL (0.07133) for two elevated dilution DLs (0.37 and 0.7)
Di-n-butyl phthalate	12/13	20	11.6	97.5% Chebyshev (Mean, Sd) UCL	Yes	
Lead	13/13	610	246.4	95% Student's-t UCL	Yes	
Selenium	1/13	0.41	0.41	Max Detected	Yes	EPC is max detection
Barium	13/13	140	114.8	95% Student's-t UCL	No	See Note 9
Silver	5/7	0.29	0.19	95% KM (t) UCL	Yes	
Cadmium	13/13	0.43	0.255	95% Student's-t UCL	No	See Note 10
Dioxin	13/13	10.07	5.018	95% Adjusted Gamma UCL	Yes	
Perchlorate	4/7	0.0076	0.00556	95% KM (t) UCL	Yes	
3,3'-Dimethylbenzidine	0/7	NA	2.65	NA	Yes	EPC is VDEQ-required

NOTES:

1. UCL-Statistical Upper Confidence Limit. Statistical analysis was performed using USEPA software ProUCL 5.0, in accordance with DEQ Guidance and in coordination with DEQ staff.
2. EPC-Exposure Point Concentration
3. COPC-Constituent of Potential Concern.
4. COPCs include all applicable target constituents for which detections were observed on the July 31, 2014 annual soil monitoring event and whose UCLs/maximum detected concentrations do not exceed their site/facility-wide background concentrations. Data collected from every sample location during this monitoring event was used with the exception of the nitroglycerin data for PAD-3. That hotspot has been further evaluated and the soil from that location and within a radius of 5 feet has been removed and disposed offsite. Four independent soil samples spaced greater than 10 feet from each other were collected at PAD-3 for nitroglycerin during Verification event performed on October 22, 2014. These 4 sampling locations are outside of the hotspot area from which soil was eventually removed and disposed offsite (in June 2015). This data consists of PAD-3N (29 mg/kg), PAD-3S (29.6 mg/kg), PAD-3E (9.64 mg/kg) and PAD-3W (2.69 mg/kg) and has been incorporated into this risk assessment.
5. Arsenic is not considered a COPC because detections in soil ranging from 0.88 to 2.2 mg/kg were less than the facility-wide background concentration (FWBC) of 15.8 mg/kg documented in the 2001 *Facility-Wide Background Study Report*. The DEQ approved Action Limit for Arsenic for Open Burning Ground is its FWBC of 15.8 mg/kg.
6. Hexavalent chromium is not considered a COPC because detections in soil (0.74 and 1.6 mg/kg) were both less than the maximum background concentration of 1.9 mg/kg observed on April 5, 2012, and five out of seven samples from the July 31, 2014 monitoring event were less than the detection limit. As allowed under the facility permit eight background samples were collected from locations approved in the 2001 *Facility-Wide Background Study Report*.
7. Per VDEQ's requests, 3,3'-Dimethylbenzidine is considered a COPC even though has never been observed above the detection limit in any soil sample. This constituent is analyzed by USEPA SW-846 Method 8270D which is the optimal and widely used method. While the typical detection limit (LOD) for this constituent during the July 31, 2014 event varied around approximately 0.5 mg/kg with LODs for a few samples at higher levels, historically the LOD for this constituent has been significantly less than the Action Limit of 0.16 mg/kg. Significant majority of the LODs for this constituent range between 0.07 and 0.08 mg/kg and it has never been detected. However, since the LOD for the 2014 event exceeded the Action Limit of 0.16 mg/kg, 3,3'-dimethylbenzidine will be applied to this risk assessment at an EPC of 2.65 mg/kg as determined conservatively by VDEQ.
8. The units of dioxin are ng/kg.
9. Barium is not considered a COPC because the observed maximum soil concentration of 140 mg/kg and the UPL of 114.8 mg/kg are less than its FWBC of 209 mg/kg as noted in the 2001 *Facility-Wide Background Study Report*.
10. Cadmium is not considered a COPC because the observed maximum soil concentration of 0.43 mg/kg and the UPL of 0.255 mg/kg are less than its FWBC of 0.69 mg/kg as noted in the 2001 *Facility-Wide Background Study Report*.
11. Chromium is not considered a COPC because the observed maximum soil concentration of 35 mg/kg and the UPL of 21.04 mg/kg are less than its FWBC of 65.3 mg/kg as noted in the 2001 *Facility-Wide Background Study Report*.
12. Even though the calculated UCL for mercury of 0.0216 mg/kg is less than its FWBC of 0.13 mg/kg, since mercury data was non-normally distributed and the highest detected concentration of mercury is 0.27 mg/kg, it is conservatively being considered a COPC.

Table 3 - Site Worker Receptor Soil Exposure Parameters

Parameter	Symbol	Unit	Site Worker
General Factors			
Averaging Time (cancer)	AT _{ow-c}	days	25,550
Averaging Time (noncancer)	AT _{ow-nc}	days	9,125
Body Weight	BW _w	kg	80
Exposure Frequency	EF _w	days/year	250
Exposure Duration	ED _{ow}	years	25
Soil Ingestion (Oral)			
Incidental Soil Ingestion Rate	IR _{ow}	mg/day	100
Soil Dermal Contact			
Exposed Skin Surface Area	SA _{ow}	cm ²	3,470
Soil to Skin Adherence Factor	AF _{ow}	mg/cm ²	0.12
Dermal Absorption	ABS	unitless	<i>Chem-Specific</i>
Soil Inhalation			
Particulate Emission Factor	PEF	m ³ /kg	1.36E+09
Volatilization Factor	VF	m ³ /kg	<i>Chem-Specific</i>
Exposure Time	ET _w	hours/day	8

Notes:

- c = carcinogenic
- nc = noncarcinogenic
- w = worker
- ow = outdoor worker

Parameter values from USEPA Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (2014).

"*Chem-Specific*" values for Dermal Absorption and Volatilization Factor are shown in Table 4.

Table 4 - Toxicity Values and Carcinogenic Slope Factors

COPC	Carcinogen	Non-Carcinogen	Exposure Route			SFO (mg/kg-day) ⁻¹	IUR (µg/m ³) ⁻¹	RfD _{Oral} (mg/kg-day)	RfC _i (mg/m ³)	GIABS	ABS	VF (m ³ /kg)
			Ingestion	Dermal	Inhalation							
Diphenylamine		X	X	X			2.5E-02		1.0E+00	1.0E-01		
2,4-Dinitrotoluene	X	X	X	X	X	3.1E-01	8.9E-05	2.0E-03	<i>1.0E+03</i>	1.0E+00	1.0E-01	
2,6-Dinitrotoluene	X	X	X	X		1.5E+00		3.0E-04		1.0E+00	9.9E-02	
2,4,6-Trinitrotoluene	X	X	X	X		3.0E-02		5.0E-04		1.0E+00	3.2E-02	
HMX		X	X	X				5.0E-02		1.0E+00	6.0E-03	
RDX	X	X	X	X		1.1E-01		3.0E-03		1.0E+00	1.5E-02	
Nitroglycerin	X	X	X	X		1.7E-02		1.0E-04		1.0E+00	1.0E-01	
Mercury		X			X				3.0E-04	1.0E+00	3.0E+04	
Diethyl phthalate		X	X	X				8.0E-01		1.0E+00	1.0E-01	
Fluoranthene		X	X	X				4.0E-02		1.0E+00	1.3E-01	
Naphthalene	X	X	X	X	X	2.0E-02	3.4E-05	2.0E-02	3.0E-03	1.0E+00	1.3E-01	4.6E+04
Benz(a)anthracene	X		X	X	X	7.3E-01	1.1E-04			1.0E+00	1.3E-01	4.4E+06
bis(2-Ethylhexyl) phthalate	X	X	X	X	X	1.4E-02	2.4E-06	2.0E-02	<i>1.0E+03</i>	1.0E+00	1.0E-01	
Di-n-butyl phthalate		X	X	X				1.0E-01		1.0E+00	1.0E-01	
Selenium		X	X		X			5.0E-03	2.0E-02	1.0E+00		
Silver		X	X					5.0E-03		4.0E-02		
Dioxin (TCDD, 2,3,7,8)	X	X	X	X	X	1.3E+05	3.8E+01	7.0E-10	4.0E-08	1.0E+00	3.0E-02	2.0E+06
Perchlorate		X	X					7.0E-04		1.0E+00		
3,3'-Dimethylbenzidine	X		X	X		1.1E+01				1.0E+00	1.0E-01	

NOTES:

Italics indicate the RfC_i value was not available, but was required to run the REAMS risk analysis. 1,000 mg/m³ has been substituted as the value for RfC_i.

For naphthalene, a carcinogenic oral slope factor was not available. The RfDo was substituted to make the REAMS model run.

In general, the most conservative values are derived from the most recent Region 3 RSL table and/or REAMS.

Bold indicates the oral slope factor (SFO) was not available, but was required to run the REAMS risk analysis. In this case, the RfDo value is used as the SFO.

The RfDo for Dioxin (TCDD-2,3,7,8) is 7.0x10⁻¹⁰ mg/kg-day; however, the lowest value able to be entered into REAMS is 1x10⁻⁸ mg/kg-day.

Table 5 - Cancer Risk Estimates and NonCancer Hazard Quotients

Constituent of Potential Concern (COPC)	Soil Exposure Route	Site Workers	
		HQ	Cancer Risk
Diphenylamine	Ingestion	3.603E-05	-
	Dermal	1.500E-05	-
	Inhalation	-	-
2,4 Dinitrotoluene	Ingestion	4.615E-04	1.022E-07
	Dermal	1.922E-04	4.250E-08
	Inhalation	0.000E+00	1.000E-10
2,6 Dinitrotoluene	Ingestion	3.579E-04	1.917E-07
	Dermal	1.475E-04	7.900E-08
	Inhalation	-	-
2,4,6 Trinitrotoluene	Ingestion	3.733E-04	2.000E-09
	Dermal	4.974E-05	3.000E-10
	Inhalation	-	-
HMX	Ingestion	5.154E-06	-
	Dermal	1.288E-07	-
	Inhalation	-	-
RDX	Ingestion	1.507E-03	1.776E-07
	Dermal	9.412E-05	1.110E-08
	Inhalation	-	-
Nitroglycerin	Ingestion	1.730E-01	1.051E-07
	Dermal	7.205E-02	4.370E-08
	Inhalation	-	-
Mercury	Ingestion	-	-
	Dermal	-	-
	Inhalation	1.315E-02	-

Table 5 - Cancer Risk Estimates and NonCancer Hazard Quotients

Constituent of Potential Concern (COPC)	Soil Exposure Route	Site Workers	
		HQ	Cancer Risk
Diethylphthalate	Ingestion	5.661E-07	-
	Dermal	2.360E-08	-
	Inhalation	-	-
Fluoranthene	Ingestion	1.777E-06	-
	Dermal	9.617E-07	-
	Inhalation	-	-
Naphthalene	Ingestion	7.620E-07	1.000E-10
	Dermal	4.125E-07	1.000E-10
	Inhalation	7.068E-04	2.570E-08
Benz(a)anthracene	Ingestion	-	6.000E-09
	Dermal	-	3.300E-09
	Inhalation	-	1.300E-09
Bis(2-ethylhexyl)phthalate	Ingestion	1.271E-05	1.300E-09
	Dermal	5.294E-06	5.000E-10
	Inhalation	0.000E+00	0.000E+00
Di-n-butylphthalate	Ingestion	9.932E-05	-
	Dermal	4.135E-05	-
	Inhalation	-	-
Selenium	Ingestion	7.021E-05	-
	Dermal	-	-
	Inhalation	8.260E-08	-
Silver	Ingestion	3.253E-05	-
	Dermal	-	-
	Inhalation	-	-

Table 5 - Cancer Risk Estimates and NonCancer Hazard Quotients

Constituent of Potential Concern (COPC)	Soil Exposure Route	Site Workers	
		HQ	Cancer Risk
Dioxin	Ingestion	4.296E-04	1.995E-07
	Dermal	5.367E-05	2.490E-08
	Inhalation	3.442E-04	1.869E-07
Perchlorate	Ingestion	6.800E-06	-
	Dermal	-	-
	Inhalation	-	-
3,3'-Dimethylbenzidine	Ingestion	-	8.913E-06
	Dermal	-	3.712E-06
	Inhalation	-	-

Bold indicates the oral slope factor (SFO) was not available, but was required to run the REAMS risk model. For naphthalene, the RFD_o value is used as the SFO.

Italics indicate the RFC_i value was not available, but was required to run the REAMS risk model.

1,000 mg/m³ has been substituted as the value for RFC_i for 2,4-Dinitrotoluene and for bis(2-Ethylhexyl) phthalate.

Table 6 - Cumulative Excess Cancer Risk Estimate and NonCancer Hazard Index

Site Workers		
	HQ	Cancer Risk
Total, Ingestion	1.76E-01	9.70E-06
Total, Dermal	7.27E-02	3.92E-06
Total, Inhalation	1.42E-02	2.14E-07
Total	0.2632782668	1.382970000E-05

Figures



Regional Site Location
Open Burning Ground (OBG), RFAAP, Radford, VA

SCALE: 1" = 1 mile

PLAN NO. B03204-207B



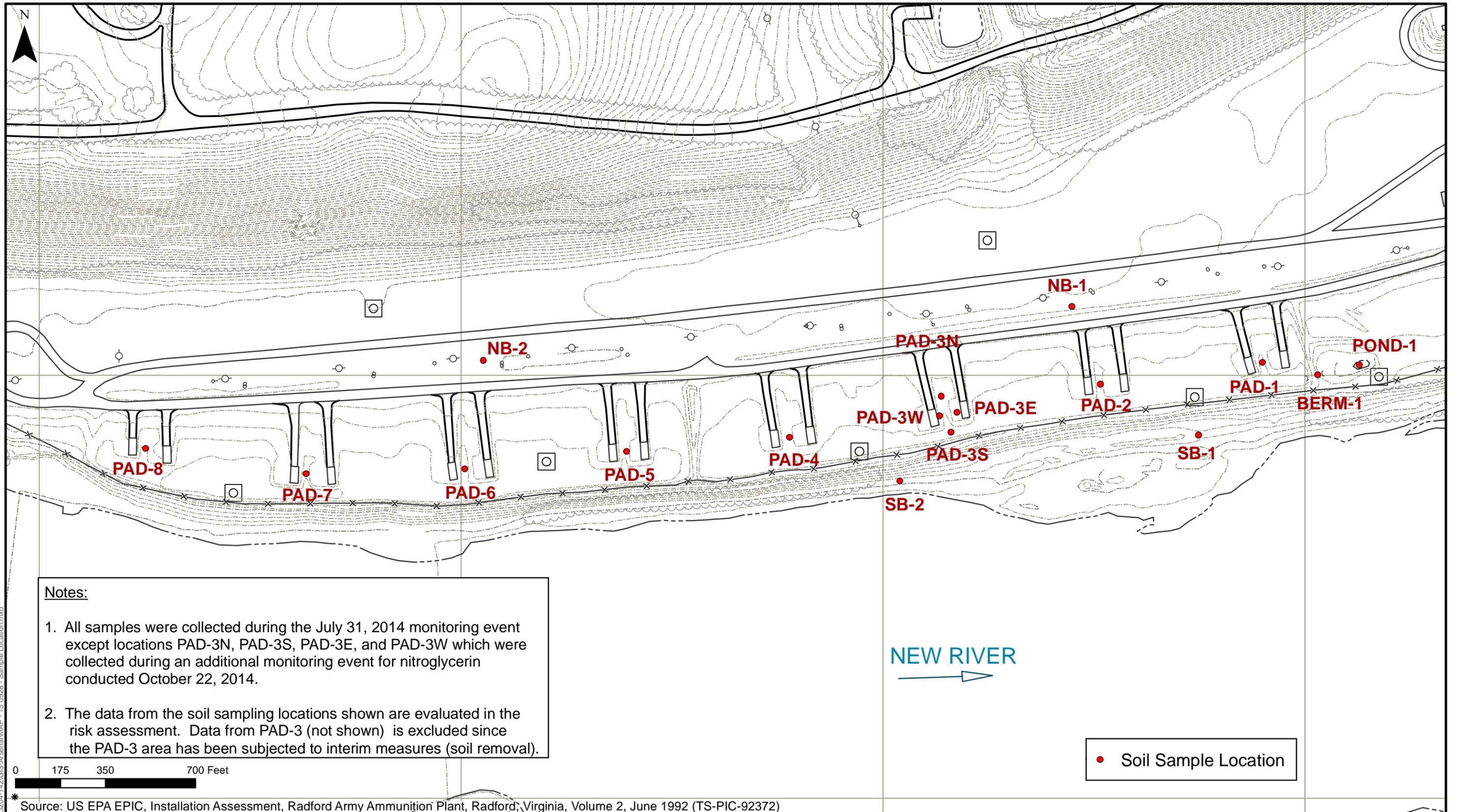
Draper Aden Associates
 Engineering • Surveying • Environmental Services

2206 South Main Street
 Blacksburg, VA 24060
 540-552-0444 Fax: 540-552-0291

Richmond, VA
 Charlottesville, VA
 Hampton Roads, VA
 Coats, NC

DESIGNED KMW
 DRAWN WMD
 CHECKED MJN
 DATE 9/30/15

FIGURE
1



Path: P:\B03200\B03204\B03204-142\GIS\Arsenal\MAP-15 0928 - Sample Location.mxd

* Source: US EPA EPIC, Installation Assessment, Radford Army Ammunition Plant, Radford, Virginia, Volume 2, June 1992 (TS-PIC-92372)

Draper Aden Associates
 Engineering • Surveying • Environmental Services
 2206 South Main Street
 Blacksburg, VA 24060
 540-552-0444 Fax: 540-552-0291

Richmond, VA
 Charlottesville, VA
 Hampton Roads, VA

DESIGNED	MJN
DRAWN	WMD
CHECKED	SN
DATE	9-29-15

Risk Assessment Soil Sample Locations
Open Burning Ground Soils Risk Assessment
RFAAP, Radford, Virginia

SCALE	1" = 350'
PLAN NO.	B03204-207B

FIGURE
2

Appendix A

ORDNANCE SYSTEMS INC.
Radford Army Ammunition Plant
P.O. Box 1
Radford, VA 24143
Telephone (540) 639-7631
Fax (540) 639-8588

March 26, 2015

Mr. Jeffery A. Steers
Director
Division of Land Protection and Revitalization
Virginia Department of Environmental Quality
629 East Main Street
Richmond, Virginia 23219

**Subject: Soil Monitoring Program - Open Burning Ground (OBG) Risk Assessment
Radford Army Ammunition Plant (RFAAP), Radford, Virginia
EPA ID#: VA1210020730**

Dear Mr. Steers:

In 2013, DEQ, RFAAP, the U.S. Army and Draper Aden Associates held several discussions on performing a risk assessment on the then current data collected from soil monitoring at the RFAAP Open Burning Ground (OBG). These discussions originated from DEQ's request to RFAAP to perform a risk assessment on the soils data due to nitroglycerin (a target constituent) exceeding its "1/10 Action Level" in several soil samples collected at the OBG in 2013. Several discussions on this matter over the summer and fall of 2013 concluded with a letter (attached) from RFAAP to DEQ dated December 5, 2013, summarizing the discussion between you and Mike Lawless of Draper Aden Associates. The letter concluded that the risk assessment of OBG soil data would be completed during the permit renewal process. The current DEQ permit for the OBG expires on October 28, 2015 and RFAAP is now in the process of preparing the permit renewal application. We are therefore revisiting this subject and submit the following information for your consideration. BAE requests concurrence of the proposed approach prior to performing the risk assessment. BAE also requests DEQ to clarify when they are requiring the facility to complete this risk assessment.

Background and Objective

Based on their review of the 2011 and 2012 OBG Soil Monitoring Annual Reports, DEQ first informed RFAAP in mid - 2013 that the facility should perform a quantitative risk assessment on the most recent annual soil monitoring data. DEQ indicated that such a risk assessment is required because more than 10 non-carcinogenic constituents were observed at reportable concentrations and one constituent, nitroglycerin (NG), exceeded its "1/10 Action Level" in several samples collected during the 2011, 2012 and 2013 sampling events. DEQ interpreted the relevant sections (Section 3.2) of the facility permit and concluded that such a risk assessment is required. The facility did not concur with that interpretation of the permit, and that permit language had not previously been interpreted in that manner.

Following further discussions by phone and email a conference call was held on September 19, 2013 among the representatives of DEQ and RFAAP (BAE, US Army, Draper Aden Associates). While DEQ and RFAAP concluded the meeting disagreeing on the interpretation of the relevant permit requirements and the need for a quantitative risk assessment, RFAAP agreed to further consider performing a quantitative risk assessment; the details of such a risk assessment were to be worked out with the DEQ's risk assessor's office.

Draper Aden Associates contacted Ms. Sonal Iyer in October 2013 and discussed the proposed risk assessment. Draper Aden Associates proposed consideration of several site specific factors in the risk assessment process. These included use of intermediate screening of data, or site specific exposure frequency, duration, and other conditions in the risk assessment process as opposed to the standard default requirements. While DEQ understood the basis for such considerations, Ms. Iyer confirmed that the risk assessment must be based on standard (conservative) default considerations because the permit does not have site use restrictions for OBG. DEQ also requires the risk assessment to be performed for all constituents (including carcinogens) and not just the non-carcinogens.

Ms. Iyer, however, agreed to treat the entire OBG as a single unit and therefore allow the use of a site-wide concentration (a statistical upper limit based on site-wide concentration of a given constituent). The risk assessment will be for an industrial receptor (site-worker). Finally, Ms. Iyer agreed that a comprehensive risk assessment report to the standards of the typical EPA risk assessment guidance is not required **but** the risk assessment will require a reasonable presentation that includes the relevant details expected in a full risk assessment report. In other words, the format is flexible but the essential elements of a standard risk assessment must be included in the report.

Additionally, during the September 19, 2013 conference call, it was agreed that BAE will propose criteria to be incorporated into the permit to evaluate future data with regard to risk such that a formal quantitative risk assessment will not be required for every event where 10 or more constituents are detected. The proposed criteria to be incorporated into the permit will be presented to DEQ in the upcoming permit renewal application.

Subsequently, BAE requested a follow up meeting with DEQ to entirely reconsider the need for the quantitative risk assessment. Consequently Mr. Mike Lawless of Draper Aden Associates met and discussed this with you. Based on that meeting and subsequent communications all parties agreed that the risk assessment would be completed during the permit renewal process, currently

on-going (see attached correspondence dated December 5, 2013).

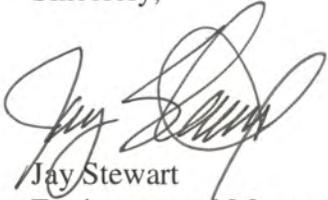
Proposed Approach – OBG Risk Assessment:

The following approach for the risk assessment of soils data at the OBG is proposed. The proposed approach incorporates comments from the September 2013 conference call and additional technical discussions with DEQ's risk assessor's office (Sonal Iyer, October 2013) to perform a onetime risk assessment using the most recent soil data. BAE requests concurrence of the proposed approach prior to performing the risk assessment. BAE also requests DEQ to clarify when they are requiring the facility to complete this risk assessment.

- In accordance with the applicable permit conditions compare the data from the most recent soil monitoring event against the appropriate Action Levels. Screen from further consideration soil data that exceed Action Levels where interim measures are planned or ongoing in accordance with Section 8 of the current permit. Should more than 10 non-carcinogens be detected, compare the data for non-carcinogens against the "1/10 Action Level."
- If a target constituent concentration is greater than the "1/10 Action Level" in one or more samples, perform a risk assessment.
- The risk assessment will consist of human health risk assessment for site worker exposure to soil only. No multimedia exposure scenarios apply and are therefore not considered.
- Perform the risk assessment in accordance with DEQ risk assessment guidelines and applicable EPA Risk Assessment Guidance (RAGS).
- Perform the risk assessment for both carcinogens and non-carcinogens.
- Treat the entire OBG as a single unit. Consequently, upper confidence limits (UCL) will be computed on the detected soil concentrations for all applicable target constituents.
- Set UCLs as exposure point concentrations (EPC).
- Use applicable DEQ/EPA standard default values for risk assessment parameters.
- Perform Risk assessment using DEQ REAMS software or other software acceptable to DEQ.
- Compute individual and cumulative risks of exposure to multiple chemicals through multiple exposure routes (inhalation, ingestion, dermal absorption).
- Compile and submit the results in a risk assessment report to DEQ in standard format to the extent required for the present purpose.
- The results of the risk assessment will be compared to DEQ and EPA standard default acceptable threshold levels for cumulative risk, i.e., Hazard Quotient 1 and excess cancer risk of 1×10^{-4} . Should the cumulative risks not exceed these threshold levels, no further action will be required. Should the cumulative risks exceed these threshold levels further discussion with DEQ will be required to determine what action, if any, is required.

If you have any questions or need further information, please feel free to contact me at 540-639-7785 or by email Jay.Stewart@baesystems.com .

Sincerely,



Jay Stewart
Environmental Manager
BAE Systems Inc, Ordnance Systems

cc: w/o enclosures
Aziz Farahmand, VDEQ-BRRO

Coordination:


J. McKenna

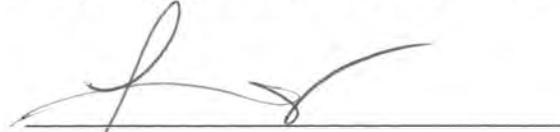
cc: RFAAP ACO Staff/McKenna
Env. File
M. Lawless, Draper Aden Associates
M. Alberts, BAE

Concerning the following:

*Open Burning Ground (OBG) – Soil Monitoring Program
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730
Proposed Risk Assessment Approach - Soil*

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SIGNATURE:



PRINTED NAME:

Luis A. Ortiz

TITLE:

Lieutenant Colonel, US Army
Commanding

SIGNATURE:



PRINTED NAME:

William M. Barnett

TITLE:

General Manager
BAE Systems

ORDNANCE SYSTEMS INC.
Radford Army Ammunition Plant
P.O. Box 1
Radford, VA 24143
Telephone (540) 639-7631
Fax (540) 639-8588

December 5, 2013

Jeffery Steers, Director
DLP&R
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 23219

Subject: RFAAP Open Burning Ground Risk Assessment

Dear Mr. Steers,

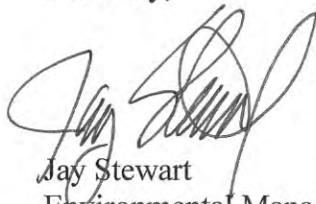
Based on your recent conversation with Mike Lawless of Draper Aden Associates, it is BAE's understanding that no action is required regarding the previously discussed risk assessment for the current soils data at the Open Burning Ground (HWMU-13). This risk assessment was discussed via conference call with your staff on September 19, 2013. The plan of action now is to address additional requirements for evaluation of future soil sampling data during the upcoming permit renewal process, and to write those requirements into the permit.

We have a meeting scheduled with Draper Aden Associates on January 9, 2014, to discuss the permit renewal process and will contact you after that meeting to begin the process and begin discussions regarding the procedures for additional evaluation of future soil sampling data.

Please confirm that our understanding is correct.

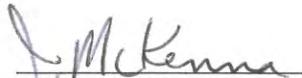
If you have any questions or need further information, please feel free to contact me at 540-639-7785 or by email Jay.Stewart@baesystems.com.

Sincerely,



Jay Stewart
Environmental Manager
BAE Systems Inc, Ordnance Systems

Coordination:


J. McKenna

cc: RFAAP ACO Staff/McKenna
Env. File
M. Lawless, Draper Aden Associates
M. Alberts, BAE



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

April 29, 2015

VIA ELECTRONIC MAIL

Mr. Jay Stewart
Environmental Manager
Radford Army Ammunition Plant
4050 Pepper's Ferry Road
Radford, Virginia 24141

**Re: Radford Army Ammunition Plant, Radford, VA
EPA ID No.VA1210020730, Open Burning Ground Risk Assessment - Timing and
Methodologies in Conjunction with the Annual Soil Monitoring Event – Guidance
from the Virginia Department of Environmental Quality**

Dear Mr. Stewart,

The Virginia Department of Environmental Quality (DEQ) is in receipt of the Radford Army Ammunition Plant's (RAAP) letter dated March 26, 2015, from the Radford, Virginia, facility.

The letter requested the DEQ's concurrence of the RAAP's included proposed risk assessment approach to address the soils with respect to the Annual Soils Monitoring Event and in proximity to the Open Burning Ground (OBG) area prior to actually performing any risk assessment. RAAP's letter also requested that the DEQ clarify when the facility is required to complete this risk assessment.

It is noted that this risk assessment discussion only addresses contamination as determined by the Annual Soil Monitoring Event(s) and not the risk assessment methodology of the closure plan within the facility's Hazardous Waste open burning treatment permit or the multi-pathway risk assessment requirements as dictated by the permit renewal process.

Based on the DEQ's review of the 2011, 2012, and 2013 OBG, **Soil Monitoring Annual Reports**, submitted as required by the facility's Hazardous Waste open burning treatment permit, the RAAP was advised by the DEQ in a conference call on September 19, 2013, and in prior telephone and e-mail correspondence that the facility should perform a quantitative risk assessment on the most recent annual soil monitoring data. The DEQ indicated that such a risk

Mr. Jay Stewart
Page 2
April 29, 2015

assessment is required because more than 10 non-carcinogenic constituents were observed at reportable concentrations and one constituent, nitroglycerin (NG), exceeded its "1/10 Action Level" in several samples collected during the 2011, 2012 and 2013 sampling events. In addition, additional technical discussions were held between the DEQ's hazardous waste risk assessor, Sonal Iyer and the facility to discuss the proposed risk assessment methodology in October 2013.

The soil samples in support of the **2014 Annual Soil Monitoring Event** were collected on July 31, 2014, with 2,4 Dinitrotoluene (carcinogen) and NG (noncarcinogen) detected at greater than the Hazardous Waste Permit-specified Action levels (ALs) at Pads 1,4 and 5 and at Pads 3 and 4, respectively. Verification re-sampling on September 18, 2014 appears to have eliminated AL exceedances of 2,4 Dinitrotoluene from consideration and NG from consideration, except at Pad 3.

To facilitate hot spot removal in accordance with the **Soil Monitoring Plan** within the Hazardous Waste Permit, *Section 8 – Interim Measures* was followed. To address NG at Pad 3, verification samples were taken on October 22, 2014, from the 0-6 inch soil layer in four locations approximately 20 feet from the point of the original exceedance of the AL in the North, South, East, and West directions. These four samples yielded NG concentrations less than the action level of 62 mg/kg. In accordance with *Section 8 – Interim Measures*, four additional random 0-24 inch core samples within a 5 foot radius of the hot spot were taken on December 8, 2014, each 6 inch interval analyzed, and the top 6 inch layer was determined to have NG levels above the detection limit.

In a letter dated March 9, 2015, the facility submitted a **Soil Removal Work Plan** to remove a 6 inch layer of soil within the 5 foot radius of the hot spot, and perform confirmation soil sampling of the sides and bottom of the excavation in accordance with the Hazardous Waste Permit, *Section 8 – Interim Measures*. Approval to proceed with this **Soil Removal Work Plan** will be provided in a separate letter.

3,3-dimethylbenzidine, a carcinogen, considered a product of incomplete combustion, was not detected in soil samples collected on July 31, 2014, for the 2014 **Annual Soil Monitoring Event** however the detection and reporting limits for this analyte are above the AL. During each previous yearly soil monitoring event, no action has been taken with regard to 3,3-dimethylbenzidine under similar scenarios, however soil samples will continue to be analyzed for this compound in the future sampling events as required by the Soil Monitoring Plan.

It was agreed between the parties (the DEQ and the RAAP), based on previous discussions documented in earlier correspondence, that the risk assessment associated with **Annual Soil Monitoring Event(s)** be done during the OBG hazardous waste permit renewal process. This process is currently underway with the current permit expiration date of October 28, 2015. Therefore, the risk assessment shall be submitted within 90 days of RAAP's receipt of this letter (or by July 28, 2015). Also, to reiterate, this risk assessment even if submitted with the permit renewal Part B Application, is not in any way related to or replaces the closure plan or the multi-pathway risk assessment.

The following are the requirements for the **Annual Soil Monitoring Event** related risk assessment – mostly derived from RAAP's March 26, 2015 proposed risk assessment methodology with the DEQ's changes indicated by underlined and struck-out text.

1. In accordance with the applicable permit conditions, compare the data from the most recent soil monitoring event against the appropriate Action Levels in the current hazardous waste permit as updated every 3 years. Data from previous soil monitoring events may be input as appropriate, but the most recent data is preferred. Screen from further consideration soil data that exceed Action Levels where interim measures are planned or ongoing in accordance with Section 8 of the current hazardous waste OBG permit. Should more than 10 non-carcinogens be detected, compare the data for non-carcinogens against the "1/10 Action Level."
2. If a target non-carcinogen (see above) constituent concentration is greater than the "1/10 Action Level" in one or more samples, perform a quantitative risk assessment for industrial (composite) worker.
3. The risk assessment will consist of human health risk assessment for site worker exposure to soil (oral, dermal and inhalation) only (250 days per year). No multimedia exposure scenarios apply and are therefore not considered.
4. Perform the risk assessment in accordance with DEQ risk assessment guidelines using REAMS (preferable) or EPA Region 3 RSL equation and defaults.
5. Perform the risk assessment for both carcinogens and non-carcinogens. Address 3,3-dimethylbenzidine – described in a previous paragraph.
6. Treat the entire OBG as a single unit. Consequently, upper confidence limits (UCL) will be computed on the detected soil concentrations for all applicable target constituents. Approve sample locations/constituents/UCLs in advance with DEQ oversight.
7. Set UCLs as exposure point concentrations (EPC).
8. Use applicable DEQ/EPA standard default values for risk assessment parameters.
9. Delineate split samples versus two separate samples in interim-measures/removals/risk assessment scenarios. Corresponding samples within 1.5 feet of each other may be considered as one sample for the purpose of this risk assessment.
10. Compute individual and cumulative risks of exposure to multiple chemicals through multiple exposure routes (inhalation, ingestion, dermal absorption).
11. Compile and submit the results in a risk assessment report to DEQ in standard format to the extent required for the present purpose.

Mr. Jay Stewart
Page 4
April 29, 2015

12. The results of the risk assessment will be compared to DEQ and EPA standard default acceptable threshold levels for cumulative risk, i.e., Hazard Quotient 1 and excess cumulative cancer risk of 1×10^{-4} . Should the cumulative risks not exceed these threshold levels, no further action will be required. Should the cumulative risks exceed these threshold levels further discussion with DEQ will be required to determine what action, if any, is required.
13. Submit gridded, to-scale diagrams depicting all soil sampling locations and depths including samples making up composite samples.

This methodology as described above is requested to be submitted as part of the **Soil Monitoring Plan** in the Part B Permit Application for the hazardous waste, OBG Permit renewal submission that is due to the DEQ by June 29, 2015.

If you have any questions or comments concerning this matter, please contact me at (804) 698-4467 or by e-mail at Ashby.Scott@deq.virginia.gov, for risk assessment related questions, please feel free to contact Ms. Sonal Iyer at (804) 698-4259 or by e-mail at Sonal.Iyer@deq.virginia.gov and for any questions regarding statistical analysis or the UCLs please contact Mr. Hasan Keceli at (804) 698-4246 or by email at Hasan.Keceli@deq.virginia.gov.

Sincerely,



Ashby R. Scott
Hazardous Waste Permit Writer
Office of Waste Permitting and Compliance

cc: Andrea Barbieri, EPA, Region III (3LC50)
Aziz Farahmand, DEQ, Blue Ridge Regional Office
Leslie A. Romanchik, DEQ, CO
Sonal Iyer, DEQ, CO
Pat McMurray, DEQ, CO
Hasan Keceli, DEQ, CO
Julia King-Collins, DEQ, CO
Central Hazardous Waste Files



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
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August 21, 2015

VIA ELECTRONIC MAIL

Mr. Jay Stewart
Environmental Manager
Radford Army Ammunition Plant
4050 Pepper's Ferry Road
Radford, Virginia 24141

**Re: Radford Army Ammunition Plant, Radford, VA
EPA ID No.VA1210020730, Open Burning Ground Risk Assessment for 2014 Soil
Monitoring Event Date – Approval of Sample Locations, Constituents of Potential
Concern and Upper Confidence Limits and 60 Day Extension Request Approval**

Dear Mr. Stewart,

The Virginia Department of Environmental Quality (DEQ) is in receipt of the Radford Army Ammunition Plant's (RAAP) electronic submission dated June 26, 2015, from the Radford, Virginia, facility in response to the DEQ's April 29, 2015 letter providing guidance on the Open Burning Ground (OGB) risk assessment.

The electronic submission requested the DEQ's concurrence of the RAAP's proposed soil sample locations, Constituents of Potential Concern (COPC) and Upper Confidence Limits (UCLs) planned to be used in the risk assessment. The DEQ has reviewed the submitted tables and figures and concurs that the proposed sample locations and UCLs are acceptable for use in the risk assessment and are approved by the DEQ.

However given the concerns raised by DEQ with the exclusion of 3,3-dimethylbenzidine from the COPC list during calls on July 10, 2015 and July 30, 2015 and from the DEQ's review of the subsequent letters explaining the reasoning for the exclusion, submitted on August 10, 2015 and August 13, 2015, the DEQ is requiring that 3,3-dimethylbenzidine be included in the COPC list to be evaluated at the standard of ½ of the modified detection limit, which was due to sample dilution. The DEQ does concur with the other COPC's proposed by RAAP for inclusion of the risk assessment.

Mr. Jay Stewart
Page 2
August 21, 2015

Additionally when the OBG risk assessment has been completed please also submit the input soil sample data used to calculate the UCLs, via an excel spreadsheet, for verification by the DEQ's statistician, Mr. Hasan Keceli, of the submitted UCLs.

A separate electronic submission, dated July 16, 2015, was received which requested a 60 day extension to the July 28, 2015 deadline for submission of the risk assessment. In light of the time it took for DEQ to review the additional information requested a 90 day extension has been approved and the new submission date for the risk assessment is now October 26, 2015.

If you have any questions or comments concerning this matter, please contact me at (804) 698-4467 or by e-mail at Ashby.Scott@deq.virginia.gov, for risk assessment related questions, please feel free to contact Ms. Sonal Iyer at (804) 698-4259 or by e-mail at Sonal.Iyer@deq.virginia.gov and for any questions regarding statistical analysis or the UCLs please contact Mr. Hasan Keceli at (804) 698-4246 or by email at Hasan.Keceli@deq.virginia.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ashby R. Scott', written in a cursive style.

Ashby R. Scott
Hazardous Waste Permit Writer
Office of Waste Permitting and Compliance

cc: Andrea Barbieri, EPA, Region III (3LC50)
Aziz Farahmand, DEQ, Blue Ridge Regional Office
Leslie A. Romanchik, DEQ, CO
Sonal Iyer, DEQ, CO
Hasan Keceli, DEQ, CO
Julia King-Collins, DEQ, CO
Central Hazardous Waste Files

**Table 1 - Sample Analytical Requirements
Open Burning Ground - Soil Monitoring Program**

Sample Location ID	Sample Analytical Method								
	VOCs (8260)	SVOCs (8270)	RCRA Metals (6010/6020/7471)	Chromium, hexavalent (7196)	Perchlorate (6850)	Dioxins/Furans (8290)	Explosives (8330)	Nitroglycerine (8332)	TPH-DRO (8015)
PAD-1	X	X	X	X	X	X	X	X	X
PAD-2	X	X	X	X	X	X	X	X	
PAD-3	X	X	X	X	X	X	X	X	
PAD-4	X	X	X	X	X	X	X	X	X
PAD-5	X	X	X	X	X	X	X	X	
PAD-6	X	X	X	X	X	X	X	X	
PAD-7	X	X	X	X	X	X	X	X	X
PAD-8	X	X	X	X	X	X	X	X	
NB-1	X	X	X			X	X	X	
NB-2	X	X	X			X	X	X	
SB-1	X	X	X			X	X	X	
SB-2	X	X	X			X	X	X	
BERM-1	X	X	X			X	X	X	
POND-1	X	X	X			X	X	X	

Notes:

X indicates sample was analyzed for corresponding analytical method.

Each method was performed for certain Constituents of Potential Concern (COPCs), which are listed on the COPC list included in Appendix C of this Annual Soil Monitoring Report.

**Table 2A - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	PAD-1 Q	PAD-2 Q	PAD-3 Q	PAD-4 Q	PAD-5 Q	PAD-6 Q	PAD-7 Q	PAD-8 Q	POND-1 Q	SB-1 Q	SB-2 Q	RL	Action Limit	Method	Unit
1,1-Dichloroethene CAS #: 75-35-4															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	1100	8260C	mg/kg
1,2-Dichloroethane CAS #: 107-06-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	2.2	8260C	mg/kg
1,3,5-Trinitrobenzene CAS #: 99-35-4															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.25	27000	8330B	mg/kg
1,3-Dinitrobenzene CAS #: 99-65-0															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.25	62	8330B	mg/kg
2,4,6-Trinitrotoluene CAS #: 118-96-7															
7/31/2014	U	U	U	U	U	U	U	U	0.327 J	U	0.527 J	0.25	79	8330B	mg/kg
2,4-Dichlorophenol CAS #: 120-83-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	1800	8270D	mg/kg
2,4-Dinitrotoluene CAS #: 121-14-2															
7/31/2014	U	U	U	3.18	0.433	U	U	U	2.28	U	U	0.25	5.5	8330B	mg/kg
2,6-Dinitrotoluene CAS #: 606-20-2															
7/31/2014	0.418 J	U	U	U	U	U	U	U	-	-	-	0.25	1.2	8330B	mg/kg
2-Amino-4,6-Dinitrotoluene CAS #: 35572-78-2															
7/31/2014	U	U	U	U	U	U	U	U	U	U	U	0.25	2000	8330B	mg/kg
2-Chlorophenol CAS #: 95-57-8															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	5100	8270D	mg/kg
2-Nitrotoluene CAS #: 88-72-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.25	13	8330B	mg/kg
3,3'-Dimethylbenzidine CAS #: 119-93-7															
7/31/2014	U AJ	-	-	-	1.6	0.16	8270D	mg/kg							
3-Methylphenol CAS #: 108-39-4															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	31000	8270D	mg/kg
3-Nitrotoluene CAS #: 99-08-1															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.25	62	8330B	mg/kg
4-Amino-2,6-Dinitrotoluene CAS #: 19406-51-0															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	U J	U J	U J	0.25	1900	8330B	mg/kg
4-Methylphenol CAS #: 106-44-5															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	62000	8270D	mg/kg
4-Nitrophenol CAS #: 100-02-7															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	1.6	7	8270D	mg/kg
4-Nitrotoluene CAS #: 99-99-0															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.25	110	8330B	mg/kg

See last page of this report for definitions.

**Table 2A - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	PAD-1 Q	PAD-2 Q	PAD-3 Q	PAD-4 Q	PAD-5 Q	PAD-6 Q	PAD-7 Q	PAD-8 Q	POND-1 Q	SB-1 Q	SB-2 Q	RL	Action Limit	Method	Unit
Acetophenone CAS #: 98-86-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	100000	8270D	mg/kg
Arsenic CAS #: 7440-38-2															
7/31/2014	1.4 J	2.2 J	1.2 J	2 J	1.6 J	0.88 J	1.9 J	1.4 J	1.7 J	2.1 J	2.2 J	1	15.8	6010C	mg/kg
Barium CAS #: 7440-39-3															
7/31/2014	89 J	120 J	92 J	140 J	140 J	92 J	100 J	80 J	92 J	100 J	120 J	20	190000	6010C	mg/kg
Benzene CAS #: 71-43-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	5.4	8260C	mg/kg
Benzo(a)anthracene CAS #: 56-55-3															
7/31/2014	U	0.005 J	U	0.027 J	U	U	U	U	-	-	-	0.33	2.1	8270D	mg/kg
Benzo(a)pyrene CAS #: 50-32-8															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.02	0.21	8270D	mg/kg
Benzo(b)fluoranthene CAS #: 205-99-2															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.33	2.1	8270D	mg/kg
Benzo(k)fluoranthene CAS #: 207-08-9															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.33	2.1	8270D	mg/kg
Benzyl Chloride CAS #: 100-44-7															
7/31/2014	U	U	U	U J	U	U	U	U	-	-	-	0.005	4.9	8260C	mg/kg
Bromomethane CAS #: 74-83-9															
7/31/2014	U	U	U	U	U	U	U	U	U	U	U	0.005	32	8260C	mg/kg
Cadmium CAS #: 7440-43-9															
7/31/2014	0.12 J	0.23 J	0.1 J	0.27 J	0.11 J	0.16 J	0.11 J	0.059 J	0.14 J	0.23 J	0.39 J	0.5	800	6010C	mg/kg
Carbon Tetrachloride CAS #: 56-23-5															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.005	3	8260C	mg/kg
Chlorobenzene CAS #: 108-90-7															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	1400	8260C	mg/kg
Chloroform CAS #: 67-66-3															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	1.5	8260C	mg/kg
Chloromethane CAS #: 74-87-3															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	500	8260C	mg/kg
Chromium, hexavalent CAS #: 18540-29-9															
7/31/2014	U	0.74 J	2.4	U	U	1.6	U	U	-	-	-	1	5.6	7196A	mg/kg
Chromium CAS #: 7440-47-3															
7/31/2014	13 J	35 J	17 J	16 J	13 J	30 J	13 J	13 J	13 J	19 J	21 J	1		6010C	mg/kg
Dibenz(a,h)anthracene CAS #: 53-70-3															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.02	0.21	8270D	mg/kg

See last page of this report for definitions.

**Table 2A - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	PAD-1 Q	PAD-2 Q	PAD-3 Q	PAD-4 Q	PAD-5 Q	PAD-6 Q	PAD-7 Q	PAD-8 Q	POND-1 Q	SB-1 Q	SB-2 Q	RL	Action Limit	Method	Unit
Fluoranthene CAS #: 206-44-0															
7/31/2014	U	0.005 J	U	0.029 J	0.006 J	0.076 J	0.005 J	0.004 J	-	-	-	0.33	22000	8270D	mg/kg
Hexachloroethane CAS #: 67-72-1															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	43	8270D	mg/kg
HMX CAS #: 2691-41-0															
7/31/2014	U J	U J	U J	0.836 J	U J	U J	U J	U J	U J	U J	U J	2.2	49000	8330B	mg/kg
Indeno(1,2,3-cd)pyrene CAS #: 193-39-5															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.33	2.1	8270D	mg/kg
Lead CAS #: 7439-92-1															
7/31/2014	38 J	160 J	280 J	270 J	150 J	610 J	81 J	110 J	86 J	54 J	120 J	0.3	800	6010C	mg/kg
Mercury CAS #: 7439-97-6															
7/31/2014	U	U	U	U	0.027 J	0.019 J	U	U	-	-	-	0.1	43	7471A	mg/kg
Methylene Chloride CAS #: 75-09-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	960	8260C	mg/kg
Naphthalene CAS #: 91-20-3															
7/31/2014	U	U	U	0.034 J	0.005 J	U	0.007 J	U	-	-	-	0.33	18	8270D	mg/kg
Nitrobenzene CAS #: 98-95-3															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.25	24	8330B	mg/kg
Nitroglycerin CAS #: 55-63-0															
7/31/2014	23.1	9.17	174	17.5	11.1	53.1	20.2 J	13.2	8.66	U	U	2.5	62	8330B	mg/kg
Diphenylamine CAS #: 122-39-4															
7/31/2014	0.073 J	U J	3.3 J	0.56 J	0.038 J	1.7 J	0.17 J	0.074 J	0.098 J	U J	0.079 J	1.6	15000	8270D	mg/kg
Perchlorate CAS #: 14797-73-0															
7/31/2014	U J	U J	U J	0.00491 J	0.00756 J	0.00621 J	0.00181J	U J	-	-	-	0.002	720	6850	mg/kg
Phenol CAS #: 108-95-2															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.33	180000	8270D	mg/kg
RDX CAS #: 121-82-4															
7/31/2014	U	U	U	5.28	U	U	U	U	-	-	-	1	24	8330B	mg/kg
Selenium CAS #: 7782-49-2															
7/31/2014	U	U	U	U	0.41 J	U	U	U	U	U	U	1	5100	6010C	mg/kg
Silver CAS #: 7440-22-4															
7/31/2014	0.11 J	0.29 J	0.14 J	0.15 J	0.11 J	U	U	0.11 J	-	-	-	1	5100	6010C	mg/kg
Tetrachloroethene CAS #: 127-18-4															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	110	8260C	mg/kg
Tetryl CAS #: 479-45-8															
7/31/2014	U J	U J	U J	U J	U J	U J	U J	U J	-	-	-	0.65	1200	8330B	mg/kg

See last page of this report for definitions.

**Table 2A - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	PAD-1 Q	PAD-2 Q	PAD-3 Q	PAD-4 Q	PAD-5 Q	PAD-6 Q	PAD-7 Q	PAD-8 Q	POND-1 Q	SB-1 Q	SB-2 Q	RL	Action Limit	Method	Unit
Toluene CAS #: 108-88-3															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	45000	8260C	mg/kg
TPH (as Diesel) CAS #: Q797															
7/31/2014	U J	-	-	190 J	-	-	8.4 J	-	-	-	-	20	11000	8015C	mg/kg
Trichloroethene CAS #: 79-01-6															
7/31/2014	U	U	U	U	U	U	U	U	U	U	U	0.005	6.4	8260C	mg/kg
Vinyl Chloride CAS #: 75-01-4															
7/31/2014	U	U	U	U	U	U	U	U	-	-	-	0.005	1.7	8260C	mg/kg

Definitions: **RL** Denotes reporting limit (obtained from permit modification – Table 1 Attachment II.C-23-24, updated September 27, 2011, Class 3 permit modification updated June 2014). RLs are equal to or greater than actual laboratory QLs, except where noted in the data validation report. However, RLs, QLs and method detection limit (DL) are less than the AL except where noted with an “A” qualifier. See data validation for actual laboratory QL. **Q** Denotes data validation qualifye
U Denotes analyte not detected at or above DL. **AL** Denotes permit Action limit (obtained from permit modification – Table 1 Attachment II.C-23-24, updated September 27, 2011, Class 3 permit modification, updated June 2014).
J Denotes is estimated. **UJ** Denotes analyte was analyzed for but not detected at or above the DL and estimated due to data validation.
A Laboratory QL and laboratory DL above permit Action limit (see data validation report).
R Denotes result rejected. (-) Denotes not sampled.

NOTES:

Results for Method 8290 Dioxin/Furan submitted as a separate report.
 For the April 2013 event, Method 8270D aliquots for POND-1 were recollected on September 10, 2013.

**Table 2B - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	BG-1A Q	BG-1B Q	BG-1C Q	BG-1D Q	BG-2A Q	BG-2B Q	BG-2C Q	BG-2D Q	NB-1 Q	NB-2 Q	BERM-1 Q	RL	Action Limit	Method	Unit
1,1-Dichloroethene	CAS #: 75-35-4														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	1100	8260C	mg/kg
1,2-Dichloroethane	CAS #: 107-06-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	2.2	8260C	mg/kg
1,3,5-Trinitrobenzene	CAS #: 99-35-4														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	27000	8330B	mg/kg
1,3-Dinitrobenzene	CAS #: 99-65-0														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	62	8330B	mg/kg
2,4,6-Trinitrotoluene	CAS #: 118-96-7														
7/31/2014	-	-	-	-	-	-	-	-	0.131 J	U	U	0.25	79	8330B	mg/kg
2,4-Dichlorophenol	CAS #: 120-83-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	1800	8270D	mg/kg
2,4-Dinitrotoluene	CAS #: 121-14-2														
7/31/2014	-	-	-	-	-	-	-	-	U	U	U	0.25	5.5	8330B	mg/kg
2,6-Dinitrotoluene	CAS #: 606-20-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	1.2	8330B	mg/kg
2-Amino-4,6-Dinitrotoluene	CAS #: 35572-78-2														
7/31/2014	-	-	-	-	-	-	-	-	U	U	U	0.25	2000	8330B	mg/kg
2-Chlorophenol	CAS #: 95-57-8														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	5100	8270D	mg/kg
2-Nitrotoluene	CAS #: 88-72-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	13	8330B	mg/kg
3,3'-Dimethylbenzidine	CAS #: 119-93-7														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	1.6	0.16	8270D	mg/kg
3-Methylphenol	CAS #: 108-39-4														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	31000	8270D	mg/kg
3-Nitrotoluene	CAS #: 99-08-1														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	62	8330B	mg/kg
4-Amino-2,6-Dinitrotoluene	CAS #: 19406-51-0														
7/31/2014	-	-	-	-	-	-	-	-	U J	U J	U J	0.25	1900	8330B	mg/kg
4-Methylphenol	CAS #: 106-44-5														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	62000	8270D	mg/kg
4-Nitrophenol	CAS #: 100-02-7														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	1.6	7	8270D	mg/kg
4-Nitrotoluene	CAS #: 99-99-0														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	110	8330B	mg/kg

**Table 2B - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	BG-1A Q	BG-1B Q	BG-1C Q	BG-1D Q	BG-2A Q	BG-2B Q	BG-2C Q	BG-2D Q	NB-1 Q	NB-2 Q	BERM-1 Q	RL	Action Limit	Method	Unit
Acetophenone	CAS #: 98-86-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	100000	8270D	mg/kg
Arsenic	CAS #: 7440-38-2														
7/31/2014	-	-	-	-	-	-	-	-	1.6 J	1.3 J	1.8 J	1	15.8	6010C	mg/kg
Barium	CAS #: 7440-39-3														
7/31/2014	-	-	-	-	-	-	-	-	110 J	100 J	81 J	20	190000	6010C	mg/kg
Benzene	CAS #: 71-43-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	5.4	8260C	mg/kg
Benzo(a)anthracene	CAS #: 56-55-3														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	2.1	8270D	mg/kg
Benzo(a)pyrene	CAS #: 50-32-8														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.02	0.21	8270D	mg/kg
Benzo(b)fluoranthene	CAS #: 205-99-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	2.1	8270D	mg/kg
Benzo(k)fluoranthene	CAS #: 207-08-9														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	2.1	8270D	mg/kg
Benzyl Chloride	CAS #: 100-44-7														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	4.9	8260C	mg/kg
Bromomethane	CAS #: 74-83-9														
7/31/2014	-	-	-	-	-	-	-	-	U	U	U	0.005	32	8260C	mg/kg
Cadmium	CAS #: 7440-43-9														
7/31/2014	-	-	-	-	-	-	-	-	0.43 J	0.2 J	0.16 J	0.5	800	6010C	mg/kg
Carbon Tetrachloride	CAS #: 56-23-5														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	3	8260C	mg/kg
Chlorobenzene	CAS #: 108-90-7														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	1400	8260C	mg/kg
Chloroform	CAS #: 67-66-3														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	1.5	8260C	mg/kg
Chloromethane	CAS #: 74-87-3														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	500	8260C	mg/kg
Chromium, hexavalent	CAS #: 18540-29-9														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	1	5.6	7196A	mg/kg
Chromium	CAS #: 7440-47-3														
7/31/2014	-	-	-	-	-	-	-	-	15 J	12 J	14 J	1		6010C	mg/kg
Dibenz(a,h)anthracene	CAS #: 53-70-3														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.02	0.21	8270D	mg/kg

**Table 2B - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

Event Date	BG-1A Q	BG-1B Q	BG-1C Q	BG-1D Q	BG-2A Q	BG-2B Q	BG-2C Q	BG-2D Q	NB-1 Q	NB-2 Q	BERM-1 Q	RL	Action Limit	Method	Unit
Fluoranthene	CAS #: 206-44-0														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	22000	8270D	mg/kg
Hexachloroethane	CAS #: 67-72-1														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	43	8270D	mg/kg
HMX	CAS #: 2691-41-0														
7/31/2014	-	-	-	-	-	-	-	-	U J	0.224 J	U J	2.2	49000	8330B	mg/kg
Indeno(1,2,3-cd)pyrene	CAS #: 193-39-5														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	2.1	8270D	mg/kg
Lead	CAS #: 7439-92-1														
7/31/2014	-	-	-	-	-	-	-	-	240 J	210 J	120 J	0.3	800	6010C	mg/kg
Mercury	CAS #: 7439-97-6														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.1	43	7471A	mg/kg
Methylene Chloride	CAS #: 75-09-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	960	8260C	mg/kg
Naphthalene	CAS #: 91-20-3														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	18	8270D	mg/kg
Nitrobenzene	CAS #: 98-95-3														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.25	24	8330B	mg/kg
Nitroglycerin	CAS #: 55-63-0														
7/31/2014	-	-	-	-	-	-	-	-	1.98	0.741 J	14	2.5	62	8330B	mg/kg
Diphenylamine	CAS #: 122-39-4														
7/31/2014	-	-	-	-	-	-	-	-	0.2 J	0.17 J	0.12 J	1.6	15000	8270D	mg/kg
Perchlorate	CAS #: 14797-73-0														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.002	720	6850	mg/kg
Phenol	CAS #: 108-95-2														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.33	180000	8270D	mg/kg
RDX	CAS #: 121-82-4														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	1	24	8330B	mg/kg
Selenium	CAS #: 7782-49-2														
7/31/2014	-	-	-	-	-	-	-	-	U	U	U	1	5100	6010C	mg/kg
Silver	CAS #: 7440-22-4														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	1	5100	6010C	mg/kg
Tetrachloroethene	CAS #: 127-18-4														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	110	8260C	mg/kg
Tetryl	CAS #: 479-45-8														
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.65	1200	8330B	mg/kg

**Table 2B - Summary of Analytical Results
Open Burning Ground - Soil Monitoring Program**

All Results Reported on a Dry Weight Basis

<i>Event Date</i>	<i>BG-1A Q</i>	<i>BG-1B Q</i>	<i>BG-1C Q</i>	<i>BG-1D Q</i>	<i>BG-2A Q</i>	<i>BG-2B Q</i>	<i>BG-2C Q</i>	<i>BG-2D Q</i>	<i>NB-1 Q</i>	<i>NB-2 Q</i>	<i>BERM-1 Q</i>	<i>RL</i>	<i>Action Limit</i>	<i>Method</i>	<i>Unit</i>
Toluene		<i>CAS #: 108-88-3</i>													
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	45000	8260C	mg/kg
TPH (as Diesel)		<i>CAS #: Q797</i>													
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	20	11000	8015C	mg/kg
Trichloroethene		<i>CAS #: 79-01-6</i>													
7/31/2014	-	-	-	-	-	-	-	-	U	U	U	0.005	6.4	8260C	mg/kg
Vinyl Chloride		<i>CAS #: 75-01-4</i>													
7/31/2014	-	-	-	-	-	-	-	-	-	-	-	0.005	1.7	8260C	mg/kg

Definitions: **RL** Denotes reporting limit. **Q** Denotes data validation qualifier. **U** Denotes analyte not detected at or above DL. **AL** Denotes permit Action limit.
J Denotes result is estimated. **UJ** Denotes analyte was analyzed for but not detected at or above the DL and estimated due to data validation.
A Denotes laboratory QL and laboratory DL above permit Action limit (see data validation report).
R Denotes result rejected. (-) Denotes not sampled. **AL and RL** obtained from permit modification – Table 1 Attachment II.C-23-24, updated June 2014, Class I Permit Mod

NOTES:
 Results for Method 8290 Dioxin/Furan submitted as a separate report.
 Laboratory QL at or below the RL and AL unless noted (see data validation report). In these cases, the result is evaluated to the method detection limit (MDL/DL). MDL is less than the RL and AL unless noted.

Table 3
 Method 8290A Dioxin/Furan Results
 July 31, 2014 Event
 2,3,7,8 - TCDD Toxicity Equivalent Quotient (TEQ)
 Radford Facility AAP, Open Burning Ground Soil Monitoring Program
 All results presented in ng/kg=pg/g=ppt

Sample Location ID	PAD-1				PAD-2				PAD-3				PAD-4			
	Depth	Constituent	TEF	Action Level	Lab Flag	Val Flag	0-6 inches Result	0-6 inches TEQ	Lab Flag	Val Flag	0-6 inches Result	0-6 inches TEQ	Lab Flag	Val Flag	0-6 inches Result	0-6 inches TEQ
2,3,7,8 Toxicity Equivalence (TEQ) ng/kg	1.2,3,4,6,7,8-HpCDD	0.01	9.3	0.093	B	J	21	0.21	B	J	24	0.24	B	J	78	0.78
	1.2,3,4,6,7,8-HpCDF	0.01	ND	ND	QBJ	J	3.4	0.034	QBJ	J	3.4	0.034	QBJ	J	ND	0.092
	1.2,3,4,7,8-HpCDD	0.01	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	0.27
	1.2,3,4,7,8-HpCDF	0.01	ND	ND	QBJ	J	0.71	0.071	QBJ	J	ND	ND	QBJ	J	2.7	0.16
	1.2,3,4,7,8-HxCDD	0.1	ND	ND	QBJ	J	0.99	0.099	QBJ	J	ND	ND	QBJ	J	1.8	0.54
	1.2,3,4,7,8-HxCDF	0.1	ND	ND	QBJ	J	1.7	0.17	QBJ	J	1.2	0.12	QBJ	J	5.4	0.14
	1.2,3,6,7,8-HxCDD	0.1	ND	ND	QBJ	J	1.9	0.19	QBJ	J	ND	ND	QBJ	J	8.4	0.84
	1.2,3,6,7,8-HxCDF	0.1	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	4.1
	1.2,3,7,8-HxCDD	0.03	ND	0.17	QJ	J	0.65	0.065	QJ	J	0.37	0.37	QJ	J	4.1	0.0195
	1.2,3,7,8-HxCDF	0.03	ND	ND	QBJ	J	0.31	0.0093	QBJ	J	0.32	0.0096	QBJ	J	0.65	0.276
	2,3,4,6,7,8-HxCDF	0.1	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	2.5	2.5
	2,3,4,7,8-HxCDF	0.3	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	1.4	1.4
	2,3,7,8-TCDD	1	ND	ND	QBJ	J	0.48	0.048	QJ	J	0.19	0.019	X		1.4	0.189
	2,3,7,8-TCDF	0.1	ND	ND	B	J	250	0.075	B	J	340	0.102	B	J	630	0.189
	OCDD	0.0003	ND	560	0.168	B	J	7.6	0.00228	QBJ	J	ND	ND	B	J	18
OCDF	0.0003	ND	ND	0.168	QBJ	J	7.6	0.00228	QBJ	J	ND	ND	B	J	18	0.005
2,3,7,8 Toxicity Equivalence (TEQ) ng/kg					J		1.71		J		0.89		J		10.07	
18 ng/kg					J		0.43		J		0.89		J		10.07	
2,3,7,8 Toxicity Equivalence (TEQ) ng/kg	1.2,3,4,6,7,8-HpCDD	0.01	14	0.14	B	J	25	0.25	B	J	18	0.18	B	J	8.5	0.085
	1.2,3,4,6,7,8-HpCDF	0.01	3.4	0.034	QBJ	J	4.6	0.046	QBJ	J	4.6	0.046	QBJ	J	ND	0.085
	1.2,3,4,7,8-HpCDD	0.01	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	0.085
	1.2,3,4,7,8-HpCDF	0.01	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	0.085
	1.2,3,4,7,8-HxCDD	0.1	1	0.1	QBJ	J	1.7	0.17	QBJ	J	1.6	0.16	QBJ	J	ND	0.085
	1.2,3,4,7,8-HxCDF	0.1	0.83	0.083	QBJ	J	1.4	0.14	QBJ	J	1.2	0.12	QBJ	J	ND	0.085
	1.2,3,6,7,8-HxCDD	0.1	ND	ND	QBJ	J	0.94	0.094	QBJ	J	0.94	0.094	QBJ	J	ND	0.085
	1.2,3,6,7,8-HxCDF	0.1	ND	ND	QBJ	J	2	0.2	QBJ	J	1.7	0.17	QBJ	J	ND	0.085
	1.2,3,7,8-HxCDD	0.1	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	ND	QBJ	J	ND	0.085
	1.2,3,7,8-HxCDF	0.1	ND	ND	QBJ	J	0.83	0.083	QJ	J	0.57	0.57	QJ	J	0.33	0.33
	1.2,3,7,8-PeCDD	1	ND	0.29	QJ	J	0.47	0.0141	QJ	J	0.58	0.0174	QJ	J	ND	0.085
	2,3,4,6,7,8-HxCDF	0.1	ND	ND	QBJ	J	0.96	0.096	QBJ	J	ND	ND	QBJ	J	ND	0.085
	2,3,4,7,8-HxCDF	0.3	ND	ND	QBJ	J	1.1	0.33	QBJ	J	0.86	0.258	QBJ	J	ND	0.085
	2,3,7,8-TCDD	1	ND	0.26	QBJ	J	0.29	0.29	QBJ	J	0.61	0.061	QJ	J	0.4	0.04
	2,3,7,8-TCDF	0.1	ND	0.65	QJ	J	0.79	0.079	CON QJ	J	0.61	0.061	QJ	J	110	0.033
OCDD	0.0003	ND	160	0.048	B	J	230	0.069	B	J	9.5	0.00285	B	J	ND	0.033
OCDF	0.0003	ND	ND	0.048	QBJ	J	ND	0.069	QBJ	J	9.5	0.00285	QBJ	J	ND	0.033
2,3,7,8 Toxicity Equivalence (TEQ) ng/kg					J		1.44		J		1.7		J		0.49	
18 ng/kg					J		1.44		J		1.7		J		0.49	

SIR/11/27/14

Table 4

Summary of Non-Carcinogenic Compounds of Potential Concern (COPC)

Comparison to 1/10 of the Action Level

Open Burning Ground, RFAAP - July 2014 Soil Monitoring Event

Analyte	Sample ID	Method	Result mg/kg	Flag	Action level mg/kg	1/10 Action level mg/kg	Quarter	COPC
Diphenylamine	PAD-7	8270D	0.17	J	15000	1500	7/31/2014	n
Diphenylamine	PAD-3	8270D	3.3	J	15000	1500	7/31/2014	n
Diphenylamine	PAD-4	8270D	0.56	J	15000	1500	7/31/2014	n
Diphenylamine	PAD-5	8270D	0.038	J	15000	1500	7/31/2014	n
Diphenylamine	PAD-1	8270D	0.073	J	15000	1500	7/31/2014	n
Diphenylamine	BERM-1	8270D	0.12	J	15000	1500	7/31/2014	n
Diphenylamine	POND-1	8270D	0.098	J	15000	1500	7/31/2014	n
Diphenylamine	PAD-6	8270D	1.7	J	15000	1500	7/31/2014	n
Diphenylamine	SB-2	8270D	0.079	J	15000	1500	7/31/2014	n
Diphenylamine	NB-2	8270D	0.17	J	15000	1500	7/31/2014	n
Diphenylamine	NB-1	8270D	0.2	J	15000	1500	7/31/2014	n
Diphenylamine	PAD-8	8270D	0.074	J	15000	1500	7/31/2014	n
Perchlorate	SB-1	6850	0.00373	J	720	72	7/31/2014	n
Perchlorate	PAD-7	6850	0.00181	J	720	72	7/31/2014	n
Perchlorate	PAD-6	6850	0.00621	J	720	72	7/31/2014	n
Perchlorate	PAD-5	6850	0.00756	J	720	72	7/31/2014	n
Perchlorate	PAD-4	6850	0.00491	J	720	72	7/31/2014	n
Perchlorate	POND-1	6850	0.00193	J	720	72	7/31/2014	n
HMX	NB-2	8330B	0.224	J	49000	4900	7/31/2014	n
HMX	PAD-4	8330B	0.836	J	49000	4900	7/31/2014	n

Table 4

Summary of Non-Carcinogenic Compounds of Potential Concern (COPC)
 Comparison to 1/10 of the Action Level
 Open Burning Ground, RFAAP - July 2014 Soil Monitoring Event

Analyte	Sample ID	Method	Result mg/kg	Flag	Action level mg/kg	1/10 Action level mg/kg	Quarter	COPC
Nitroglycerin	PAD-6	8330B	53.1		62	6.2	7/31/2014	n
Nitroglycerin	PAD-5	8330B	11.1		62	6.2	7/31/2014	n
Nitroglycerin	PAD-4	8330B	17.5		62	6.2	7/31/2014	n
Nitroglycerin	PAD-8	8330B	13.2		62	6.2	7/31/2014	n
Nitroglycerin	NB-1	8330B	1.98		62	6.2	7/31/2014	n
Nitroglycerin	PAD-3	8330B	174		62	6.2	7/31/2014	n
Nitroglycerin	PAD-2	8330B	9.17		62	6.2	7/31/2014	n
Nitroglycerin	NB-2	8330B	0.741	J	62	6.2	7/31/2014	n
Nitroglycerin	PAD-1	8330B	23.1		62	6.2	7/31/2014	n
Nitroglycerin	PAD-7	8330B	20.2	J	62	6.2	7/31/2014	n
Nitroglycerin	BERM-1	8330B	14		62	6.2	7/31/2014	n
Nitroglycerin	POND-1	8330B	8.66		62	6.2	7/31/2014	n
Mercury	PAD-6	7471A	0.019	J	43	4.3	7/31/2014	n
Mercury	PAD-5	7471A	0.027	J	43	4.3	7/31/2014	n
Diethylphthalate	POND-1	8270D	0.36		490000	49000	7/31/2014	n
Diethylphthalate	SB-2	8270D	0.51		490000	49000	7/31/2014	n
Diethylphthalate	NB-2	8270D	0.65		490000	49000	7/31/2014	n
Diethylphthalate	NB-1	8270D	1.2		490000	49000	7/31/2014	n
Diethylphthalate	PAD-4	8270D	0.42	J	490000	49000	7/31/2014	n
Diethylphthalate	PAD-6	8270D	0.78	J	490000	49000	7/31/2014	n
Diethylphthalate	PAD-7	8270D	0.17	J	490000	49000	7/31/2014	n
Fluoranthene	PAD-8	8270D	0.004	J	22000	2200	7/31/2014	n
Fluoranthene	PAD-4	8270D	0.029	J	22000	2200	7/31/2014	n
Fluoranthene	PAD-7	8270D	0.005	J	22000	2200	7/31/2014	n
Fluoranthene	PAD-5	8270D	0.006	J	22000	2200	7/31/2014	n
Fluoranthene	PAD-2	8270D	0.005	J	22000	2200	7/31/2014	n
Fluoranthene	PAD-6	8270D	0.076	J	22000	2200	7/31/2014	n

Table 4

Summary of Non-Carcinogenic Compounds of Potential Concern (COPC)
 Comparison to 1/10 of the Action Level
 Open Burning Ground, RFAAP - July 2014 Soil Monitoring Event

Analyte	Sample ID	Method	Result mg/kg	Flag	Action level mg/kg	1/10 Action level mg/kg	Quarter	COPC
Di-n-butylphthalate	NB-2	8270D	0.54		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-3	8270D	56		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-2	8270D	0.12	J	62000	6200	7/31/2014	n
Di-n-butylphthalate	POND-1	8270D	0.4		62000	6200	7/31/2014	n
Di-n-butylphthalate	BERM-1	8270D	2.1		62000	6200	7/31/2014	n
Di-n-butylphthalate	SB-2	8270D	2.4		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-8	8270D	0.43		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-1	8270D	0.32		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-5	8270D	0.19		62000	6200	7/31/2014	n
Di-n-butylphthalate	NB-1	8270D	0.99		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-4	8270D	1.1		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-6	8270D	20		62000	6200	7/31/2014	n
Di-n-butylphthalate	PAD-7	8270D	0.48	J	62000	6200	7/31/2014	n
Selenium	PAD-5	6010C	0.41	J	5100	510	7/31/2014	n
Barium	PAD-6	6010C	92	J	190000	19000	7/31/2014	n
Barium	NB-1	6010C	110	J	190000	19000	7/31/2014	n
Barium	PAD-1	6010C	89	J	190000	19000	7/31/2014	n
Barium	NB-2	6010C	100	J	190000	19000	7/31/2014	n
Barium	PAD-4	6010C	140	J	190000	19000	7/31/2014	n
Barium	PAD-3	6010C	92	J	190000	19000	7/31/2014	n
Barium	PAD-5	6010C	140	J	190000	19000	7/31/2014	n
Barium	PAD-2	6010C	120	J	190000	19000	7/31/2014	n
Barium	PAD-7	6010C	100	J	190000	19000	7/31/2014	n
Barium	BERM-1	6010C	81	J	190000	19000	7/31/2014	n
Barium	POND-1	6010C	92	J	190000	19000	7/31/2014	n
Barium	PAD-8	6010C	80	J	190000	19000	7/31/2014	n
Barium	SB-2	6010C	120	J	190000	19000	7/31/2014	n
Barium	SB-1	6010C	100	J	190000	19000	7/31/2014	n

Table 4

Summary of Non-Carcinogenic Compounds of Potential Concern (COPC)
 Comparison to 1/10 of the Action Level
 Open Burning Ground, RFAAP - July 2014 Soil Monitoring Event

Analyte	Sample ID	Method	Result mg/kg	Flag	Action level mg/kg	1/10 Action level mg/kg	Quarter	COPC
Silver	PAD-8	6010C	0.11	J	5100	510	7/31/2014	n
Silver	PAD-5	6010C	0.11	J	5100	510	7/31/2014	n
Silver	PAD-4	6010C	0.15	J	5100	510	7/31/2014	n
Silver	PAD-1	6010C	0.11	J	5100	510	7/31/2014	n
Silver	PAD-3	6010C	0.14	J	5100	510	7/31/2014	n
Silver	PAD-2	6010C	0.29	J	5100	510	7/31/2014	n
Cadmium	PAD-3	6010C	0.1	J	800	80	7/31/2014	n
Cadmium	SB-2	6010C	0.39	J	800	80	7/31/2014	n
Cadmium	SB-1	6010C	0.23	J	800	80	7/31/2014	n
Cadmium	NB-2	6010C	0.2	J	800	80	7/31/2014	n
Cadmium	PAD-6	6010C	0.16	J	800	80	7/31/2014	n
Cadmium	BERM-1	6010C	0.16	J	800	80	7/31/2014	n
Cadmium	PAD-8	6010C	0.059	J	800	80	7/31/2014	n
Cadmium	POND-1	6010C	0.14	J	800	80	7/31/2014	n
Cadmium	PAD-5	6010C	0.11	J	800	80	7/31/2014	n
Cadmium	PAD-7	6010C	0.11	J	800	80	7/31/2014	n
Cadmium	NB-1	6010C	0.43	J	800	80	7/31/2014	n
Cadmium	PAD-2	6010C	0.23	J	800	80	7/31/2014	n
Cadmium	PAD-1	6010C	0.12	J	800	80	7/31/2014	n
Cadmium	PAD-4	6010C	0.27	J	800	80	7/31/2014	n

Notes:

Action Level based on Table 1 Attachment II.C-23-24 of June 2014 Class I permit modification

J - denotes result less than the QL

n - denotes Non-carcinogenic Compound of Potential Concern based on Regional Screening Level (RSL) Summary Table Jan 2015

See data validation report for final validated results.

Summary of 3,3-Dimethylbenzidine Results - OBG Annual Soil Monitoring - RFAAP, Radford VA

Sample Date	SampleID	Analyte	Lab Result (mg/kg)	LOQ	LOD	Dilution Factor
07-Jan-08	BERM-1	3,3'-Dimethylbenzidine	U	1.9	0.075	1
19-Nov-08	BERM-1	3,3'-Dimethylbenzidine	U	1.8	0.072	1
28-Jan-09	BERM-1	3,3'-Dimethylbenzidine	U	3.9	0.15	2
09-Dec-09	BERM-1	3,3'-Dimethylbenzidine	U	2	0.079	1
02-Mar-10	BERM-1	3,3'-Dimethylbenzidine	U	1.9	0.076	1
18-Nov-10	BERM-1	3,3'-Dimethylbenzidine	U	1.9	0.076	1
31-Jan-11	BERM-1	3,3'-Dimethylbenzidine	U	1.9	0.075	1
08-Jan-08	NB-1	3,3'-Dimethylbenzidine	U	2	0.079	1
19-Nov-08	NB-1	3,3'-Dimethylbenzidine	U	3.9	0.15	2
28-Jan-09	NB-1	3,3'-Dimethylbenzidine	U	2.1	0.082	1
09-Dec-09	NB-1	3,3'-Dimethylbenzidine	U	2	0.077	1
02-Mar-10	NB-1	3,3'-Dimethylbenzidine	U	2	0.08	1
18-Nov-10	NB-1	3,3'-Dimethylbenzidine	U	2.1	0.081	1
31-Jan-11	NB-1	3,3'-Dimethylbenzidine	U	2	0.079	1
08-Jan-08	NB-2	3,3'-Dimethylbenzidine	U	1.9	0.076	1
19-Nov-08	NB-2	3,3'-Dimethylbenzidine	U	1.8	0.071	1
28-Jan-09	NB-2	3,3'-Dimethylbenzidine	U	3.7	0.15	2
09-Dec-09	NB-2	3,3'-Dimethylbenzidine	U	1.9	0.076	1
02-Mar-10	NB-2	3,3'-Dimethylbenzidine	U	3.8	0.15	2
18-Nov-10	NB-2	3,3'-Dimethylbenzidine	U	3.8	0.15	2
31-Jan-11	NB-2	3,3'-Dimethylbenzidine	U	1.9	0.075	1
07-Jan-08	PAD-1	3,3'-Dimethylbenzidine	U	1.9	0.075	1
24-Nov-08	PAD-1	3,3'-Dimethylbenzidine	U	1.9	0.074	1
28-Jan-09	PAD-1	3,3'-Dimethylbenzidine	U	3.9	0.15	2
09-Dec-09	PAD-1	3,3'-Dimethylbenzidine	U	1.8	0.072	1
02-Mar-10	PAD-1	3,3'-Dimethylbenzidine	U	1.9	0.074	1
17-Nov-10	PAD-1	3,3'-Dimethylbenzidine	U	1.7	0.067	1
31-Jan-11	PAD-1	3,3'-Dimethylbenzidine	U	24	0.95	12.5
05-Apr-12	PAD-1	3,3'-Dimethylbenzidine	U	1.1	0.53	1
09-Apr-13	PAD-1	3,3'-Dimethylbenzidine	U	1	0.52	1
31-Jul-14	PAD-1	3,3'-Dimethylbenzidine	U	1	0.51	1
08-Jan-08	PAD-2	3,3'-Dimethylbenzidine	U	1.9	0.075	1
24-Nov-08	PAD-2	3,3'-Dimethylbenzidine	U	1.8	0.071	1
28-Jan-09	PAD-2	3,3'-Dimethylbenzidine	U	7.6	0.3	4
09-Dec-09	PAD-2	3,3'-Dimethylbenzidine	U	1.9	0.076	1
02-Mar-10	PAD-2	3,3'-Dimethylbenzidine	U	1.9	0.075	1
17-Nov-10	PAD-2	3,3'-Dimethylbenzidine	U	1.9	0.073	1
31-Jan-11	PAD-2	3,3'-Dimethylbenzidine	U	1.9	0.073	1
05-Apr-12	PAD-2	3,3'-Dimethylbenzidine	U	1.1	0.55	1
09-Apr-13	PAD-2	3,3'-Dimethylbenzidine	U	1.1	0.56	1
31-Jul-14	PAD-2	3,3'-Dimethylbenzidine	U	1	0.51	1
07-Jan-08	PAD-3	3,3'-Dimethylbenzidine	U	1.9	0.074	1
24-Nov-08	PAD-3	3,3'-Dimethylbenzidine	U	1.8	0.069	1
28-Jan-09	PAD-3	3,3'-Dimethylbenzidine	U	1.9	0.076	1
09-Dec-09	PAD-3	3,3'-Dimethylbenzidine	U	1.9	0.074	1
02-Mar-10	PAD-3	3,3'-Dimethylbenzidine	U	2	0.079	1
17-Nov-10	PAD-3	3,3'-Dimethylbenzidine	U	1.8	0.069	1
31-Jan-11	PAD-3	3,3'-Dimethylbenzidine	U	3.9	0.15	2

Summary of 3,3-Dimethylbenzidine Results - OBG Annual Soil Monitoring - RFAAP, Radford VA

Sample Date	SampleID	Analyte	Lab Result (mg/kg)	LOQ	LOD	Dilution Factor
05-Apr-12	PAD-3	3,3'-Dimethylbenzidine	U	1.2	0.6	1
09-Apr-13	PAD-3	3,3'-Dimethylbenzidine	U	5.4	2.7	5
31-Jul-14	PAD-3	3,3'-Dimethylbenzidine	U	10	5.2	10
08-Jan-08	PAD-4	3,3'-Dimethylbenzidine	U	1.8	0.072	1
24-Nov-08	PAD-4	3,3'-Dimethylbenzidine	U	1.9	0.073	1
28-Jan-09	PAD-4	3,3'-Dimethylbenzidine	U	13	0.5	6.66
09-Dec-09	PAD-4	3,3'-Dimethylbenzidine	U	1.9	0.076	1
02-Mar-10	PAD-4	3,3'-Dimethylbenzidine	U	7.9	0.31	4
17-Nov-10	PAD-4	3,3'-Dimethylbenzidine	U	1.9	0.073	1
31-Jan-11	PAD-4	3,3'-Dimethylbenzidine	U	3.8	0.15	2
05-Apr-12	PAD-4	3,3'-Dimethylbenzidine	U	1.1	0.56	1
09-Apr-13	PAD-4	3,3'-Dimethylbenzidine	U	5.8	2.9	5
31-Jul-14	PAD-4	3,3'-Dimethylbenzidine	U	5.5	2.8	5
07-Jan-08	PAD-5	3,3'-Dimethylbenzidine	U	1.9	0.075	1
24-Nov-08	PAD-5	3,3'-Dimethylbenzidine	U	7	0.28	4
28-Jan-09	PAD-5	3,3'-Dimethylbenzidine	U	2	0.078	1
09-Dec-09	PAD-5	3,3'-Dimethylbenzidine	U	1.9	0.074	1
02-Mar-10	PAD-5	3,3'-Dimethylbenzidine	U	1.9	0.075	1
17-Nov-10	PAD-5	3,3'-Dimethylbenzidine	U	1.9	0.074	1
01-Feb-11	PAD-5	3,3'-Dimethylbenzidine	U	1.8	0.07	1
10-Apr-12	PAD-5	3,3'-Dimethylbenzidine	U	1.2	0.58	1
09-Apr-13	PAD-5	3,3'-Dimethylbenzidine	U	1.2	0.53	1
31-Jul-14	PAD-5	3,3'-Dimethylbenzidine	U	1	0.51	1
07-Jan-08	PAD-6	3,3'-Dimethylbenzidine	U	1.8	0.073	1
24-Nov-08	PAD-6	3,3'-Dimethylbenzidine	U	12	0.46	6.66
28-Jan-09	PAD-6	3,3'-Dimethylbenzidine	U	7.5	0.3	4
09-Dec-09	PAD-6	3,3'-Dimethylbenzidine	U	7.3	0.29	4
02-Mar-10	PAD-6	3,3'-Dimethylbenzidine	U	9	0.35	5
17-Nov-10	PAD-6	3,3'-Dimethylbenzidine	U	1.8	0.072	1
01-Feb-11	PAD-6	3,3'-Dimethylbenzidine	U	46	1.8	25
05-Apr-12	PAD-6	3,3'-Dimethylbenzidine	U	1.1	0.57	1
09-Apr-13	PAD-6	3,3'-Dimethylbenzidine	U	5.5	2.8	5
31-Jul-14	PAD-6	3,3'-Dimethylbenzidine	U	11	5.3	10
07-Jan-08	PAD-7	3,3'-Dimethylbenzidine	U	3.6	0.14	2
24-Nov-08	PAD-7	3,3'-Dimethylbenzidine	U	1.8	0.069	1
28-Jan-09	PAD-7	3,3'-Dimethylbenzidine	U	1.8	0.072	1
09-Dec-09	PAD-7	3,3'-Dimethylbenzidine	U	1.9	0.074	1
02-Mar-10	PAD-7	3,3'-Dimethylbenzidine	U	1.9	0.073	1
18-Nov-10	PAD-7	3,3'-Dimethylbenzidine	U	1.8	0.071	1
01-Feb-11	PAD-7	3,3'-Dimethylbenzidine	U	1.8	0.072	1
05-Apr-12	PAD-7	3,3'-Dimethylbenzidine	U	1.1	0.55	1
09-Apr-13	PAD-7	3,3'-Dimethylbenzidine	U	1.1	0.53	1
31-Jul-14	PAD-7	3,3'-Dimethylbenzidine	U	1	0.52	1
07-Jan-08	PAD-8	3,3'-Dimethylbenzidine	U	1.9	0.073	1
24-Nov-08	PAD-8	3,3'-Dimethylbenzidine	U	1.8	0.072	1
28-Jan-09	PAD-8	3,3'-Dimethylbenzidine	U	2	0.077	1
09-Dec-09	PAD-8	3,3'-Dimethylbenzidine	U	1.9	0.074	1
02-Mar-10	PAD-8	3,3'-Dimethylbenzidine	U	1.9	0.076	1

Summary of 3,3-Dimethylbenzidine Results - OBG Annual Soil Monitoring - RFAAP, Radford VA

Sample Date	SampleID	Analyte	Lab Result (mg/kg)	LOQ	LOD	Dilution Factor
17-Nov-10	PAD-8	3,3'-Dimethylbenzidine	U	1.9	0.073	1
01-Feb-11	PAD-8	3,3'-Dimethylbenzidine	U	3.7	0.15	2
05-Apr-12	PAD-8	3,3'-Dimethylbenzidine	U	1.2	0.58	1
09-Apr-13	PAD-8	3,3'-Dimethylbenzidine	U	1.1	0.53	1
31-Jul-14	PAD-8	3,3'-Dimethylbenzidine	U	1	0.51	1
07-Jan-08	PAD-X	3,3'-Dimethylbenzidine	U	1.8	0.072	1
24-Nov-08	PAD-X	3,3'-Dimethylbenzidine	U	1.8	0.07	1
28-Jan-09	PAD-X	3,3'-Dimethylbenzidine	U	1.9	0.073	1
09-Dec-09	PAD-X	3,3'-Dimethylbenzidine	U	1.8	0.072	1
02-Mar-10	PAD-X	3,3'-Dimethylbenzidine	U	36	1.4	20
18-Nov-10	PAD-X	3,3'-Dimethylbenzidine	U	1.9	0.073	1
31-Jan-11	PAD-X	3,3'-Dimethylbenzidine	U	1.8	0.072	1
05-Apr-12	PAD-X	3,3'-Dimethylbenzidine	U	1.1	0.56	1
09-Apr-13	PAD-X	3,3'-Dimethylbenzidine	U	1.1	0.54	1
31-Jul-14	PAD-X	3,3'-Dimethylbenzidine	U	1.1	0.53	1
08-Jan-08	POND-1	3,3'-Dimethylbenzidine	U	1.9	0.074	1
19-Nov-08	POND-1	3,3'-Dimethylbenzidine	U	2	0.077	1
28-Jan-09	POND-1	3,3'-Dimethylbenzidine	U	2	0.08	1
09-Dec-09	POND-1	3,3'-Dimethylbenzidine	U	2	0.079	1
02-Mar-10	POND-1	3,3'-Dimethylbenzidine	U	2.2	0.087	1
17-Nov-10	POND-1	3,3'-Dimethylbenzidine	U	2	0.078	1
31-Jan-11	POND-1	3,3'-Dimethylbenzidine	U	2	0.077	1
08-Jan-08	SB-1	3,3'-Dimethylbenzidine	U	2.1	0.082	1
19-Nov-08	SB-1	3,3'-Dimethylbenzidine	U	2.4	0.093	1
28-Jan-09	SB-1	3,3'-Dimethylbenzidine	U	2.1	0.084	1
09-Dec-09	SB-1	3,3'-Dimethylbenzidine	U	2.3	0.09	1
02-Mar-10	SB-1	3,3'-Dimethylbenzidine	U	2.4	0.096	1
18-Nov-10	SB-1	3,3'-Dimethylbenzidine	U	2.2	0.086	1
31-Jan-11	SB-1	3,3'-Dimethylbenzidine	U	1.9	0.075	1
08-Jan-08	SB-2	3,3'-Dimethylbenzidine	U	2.2	0.089	1
19-Nov-08	SB-2	3,3'-Dimethylbenzidine	U	2	0.078	1
28-Jan-09	SB-2	3,3'-Dimethylbenzidine	U	2.2	0.085	1
09-Dec-09	SB-2	3,3'-Dimethylbenzidine	U	2	0.077	1
02-Mar-10	SB-2	3,3'-Dimethylbenzidine	U	2.5	0.099	1
18-Nov-10	SB-2	3,3'-Dimethylbenzidine	U	2.2	0.088	1
31-Jan-11	SB-2	3,3'-Dimethylbenzidine	U	2.3	0.092	1

Notes	
U	Denotes not detected at or above LOD.
PAD-X	Denotes blind field duplicate for PAD-7
LOD	Denotes laboratory limit of detection. Result reported on a dry weight basis and adjusted for sample dilution, where applicable.
LOQ	Denotes laboratory limit of quantitation. Result reported on a dry weight basis and adjusted for sample dilution, where applicable.

Appendix B

Appendix C

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation		9/3/2015 10:30:33 AM									
5	From File		APPENDIX Input Data OBG Risk Assessment Final Modified for ProUCL_a.xls									
6	Full Precision		OFF									
7	Confidence Coefficient		95%									
8	Number of Bootstrap Operations		2000									
9												
10	Diphenylamine											
11												
12	General Statistics											
13	Total Number of Observations			13			Number of Distinct Observations			12		
14	Number of Detects			11			Number of Non-Detects			2		
15	Number of Distinct Detects			10			Number of Distinct Non-Detects			2		
16	Minimum Detect			0.038			Minimum Non-Detect			0.034		
17	Maximum Detect			1.7			Maximum Non-Detect			0.043		
18	Variance Detects			0.236			Percent Non-Detects			15.38%		
19	Mean Detects			0.298			SD Detects			0.486		
20	Median Detects			0.12			CV Detects			1.63		
21	Skewness Detects			2.872			Kurtosis Detects			8.553		
22	Mean of Logged Detects			-1.88			SD of Logged Detects			1.062		
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic			0.548			Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value			0.85			Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic			0.398			Lilliefors GOF Test					
28	5% Lilliefors Critical Value			0.267			Detected Data Not Normal at 5% Significance Level					
29	Detected Data Not Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean			0.258			Standard Error of Mean			0.127		
33	SD			0.437			95% KM (BCA) UCL			0.518		
34	95% KM (t) UCL			0.484			95% KM (Percentile Bootstrap) UCL			0.474		
35	95% KM (z) UCL			0.467			95% KM Bootstrap t UCL			1.571		
36	90% KM Chebyshev UCL			0.639			95% KM Chebyshev UCL			0.812		
37	97.5% KM Chebyshev UCL			1.052			99% KM Chebyshev UCL			1.523		
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic			1.099			Anderson-Darling GOF Test					
41	5% A-D Critical Value			0.757			Detected Data Not Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic			0.311			Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value			0.264			Detected Data Not Gamma Distributed at 5% Significance Level					
44	Detected Data Not Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)			0.875			k star (bias corrected MLE)			0.697		
48	Theta hat (MLE)			0.341			Theta star (bias corrected MLE)			0.428		
49	nu hat (MLE)			19.26			nu star (bias corrected)			15.34		
50	MLE Mean (bias corrected)			0.298			MLE Sd (bias corrected)			0.357		
51												
52	Gamma Kaplan-Meier (KM) Statistics											
53	k hat (KM)			0.348			nu hat (KM)			9.054		

	A	B	C	D	E	F	G	H	I	J	K	L
54	Approximate Chi Square Value (9.05, α)					3.359	Adjusted Chi Square Value (9.05, β)					2.883
55	95% Gamma Approximate KM-UCL (use when $n \geq 50$)					0.695	95% Gamma Adjusted KM-UCL (use when $n < 50$)					0.81
56												
57	Gamma ROS Statistics using Imputed Non-Detects											
58	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
59	GROS may not be used when kstar of detected data is small such as < 0.1											
60	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
61	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
62	Minimum					0.01	Mean					0.254
63	Maximum					1.7	Median					0.098
64	SD					0.457	CV					1.799
65	k hat (MLE)					0.657	k star (bias corrected MLE)					0.557
66	Theta hat (MLE)					0.387	Theta star (bias corrected MLE)					0.456
67	nu hat (MLE)					17.08	nu star (bias corrected)					14.47
68	MLE Mean (bias corrected)					0.254	MLE Sd (bias corrected)					0.34
69							Adjusted Level of Significance (β)					0.0301
70	Approximate Chi Square Value (14.47, α)					6.894	Adjusted Chi Square Value (14.47, β)					6.163
71	95% Gamma Approximate UCL (use when $n \geq 50$)					0.533	95% Gamma Adjusted UCL (use when $n < 50$)					0.596
72												
73	Lognormal GOF Test on Detected Observations Only											
74	Shapiro Wilk Test Statistic					0.894	Shapiro Wilk GOF Test					
75	5% Shapiro Wilk Critical Value					0.85	Detected Data appear Lognormal at 5% Significance Level					
76	Lilliefors Test Statistic					0.218	Lilliefors GOF Test					
77	5% Lilliefors Critical Value					0.267	Detected Data appear Lognormal at 5% Significance Level					
78	Detected Data appear Lognormal at 5% Significance Level											
79												
80	Lognormal ROS Statistics Using Imputed Non-Detects											
81	Mean in Original Scale					0.255	Mean in Log Scale					-2.228
82	SD in Original Scale					0.456	SD in Log Scale					1.295
83	95% t UCL (assumes normality of ROS data)					0.481	95% Percentile Bootstrap UCL					0.482
84	95% BCA Bootstrap UCL					0.604	95% Bootstrap t UCL					1.416
85	95% H-UCL (Log ROS)					0.883						
86												
87	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
88	KM Mean (logged)					-2.106	95% H-UCL (KM -Log)					0.544
89	KM SD (logged)					1.073	95% Critical H Value (KM-Log)					2.976
90	KM Standard Error of Mean (logged)					0.312						
91												
92	DL/2 Statistics											
93	DL/2 Normal						DL/2 Log-Transformed					
94	Mean in Original Scale					0.255	Mean in Log Scale					-2.199
95	SD in Original Scale					0.456	SD in Log Scale					1.246
96	95% t UCL (Assumes normality)					0.481	95% H-Stat UCL					0.787
97	DL/2 is not a recommended method, provided for comparisons and historical reasons											
98												
99	Nonparametric Distribution Free UCL Statistics											
100	Detected Data appear Lognormal Distributed at 5% Significance Level											
101												
102	Suggested UCL to Use											
103	97.5% KM (Chebyshev) UCL					1.052						
104												
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											

	A	B	C	D	E	F	G	H	I	J	K	L
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												
110	Perchlorate											
111												
112	General Statistics											
113	Total Number of Observations			7		Number of Distinct Observations			6			
114	Number of Detects			4		Number of Non-Detects			3			
115	Number of Distinct Detects			4		Number of Distinct Non-Detects			2			
116	Minimum Detect			0.00181		Minimum Non-Detect			0.00101			
117	Maximum Detect			0.00756		Maximum Non-Detect			0.00102			
118	Variance Detects			6.0473E-6		Percent Non-Detects			42.86%			
119	Mean Detects			0.00512		SD Detects			0.00246			
120	Median Detects			0.00556		CV Detects			0.48			
121	Skewness Detects			-0.923		Kurtosis Detects			0.82			
122	Mean of Logged Detects			-5.399		SD of Logged Detects			0.635			
123												
124	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
125	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
126	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
127	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0											
128												
129	Normal GOF Test on Detects Only											
130	Shapiro Wilk Test Statistic			0.958		Shapiro Wilk GOF Test						
131	5% Shapiro Wilk Critical Value			0.748		Detected Data appear Normal at 5% Significance Level						
132	Lilliefors Test Statistic			0.216		Lilliefors GOF Test						
133	5% Lilliefors Critical Value			0.443		Detected Data appear Normal at 5% Significance Level						
134	Detected Data appear Normal at 5% Significance Level											
135												
136	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
137	Mean		0.00336		Standard Error of Mean			0.00113				
138	SD		0.00259		95% KM (BCA) UCL			N/A				
139	95% KM (t) UCL		0.00556		95% KM (Percentile Bootstrap) UCL			N/A				
140	95% KM (z) UCL		0.00522		95% KM Bootstrap t UCL			N/A				
141	90% KM Chebyshev UCL		0.00676		95% KM Chebyshev UCL			0.0083				
142	97.5% KM Chebyshev UCL		0.0104		99% KM Chebyshev UCL			0.0146				
143												
144	Gamma GOF Tests on Detected Observations Only											
145	A-D Test Statistic		0.379		Anderson-Darling GOF Test							
146	5% A-D Critical Value		0.659		Detected data appear Gamma Distributed at 5% Significance Level							
147	K-S Test Statistic		0.282		Kolmogrov-Smirnoff GOF							
148	5% K-S Critical Value		0.396		Detected data appear Gamma Distributed at 5% Significance Level							
149	Detected data appear Gamma Distributed at 5% Significance Level											
150												
151	Gamma Statistics on Detected Data Only											
152	k hat (MLE)		4.152		k star (bias corrected MLE)			1.205				
153	Theta hat (MLE)		0.00123		Theta star (bias corrected MLE)			0.00425				
154	nu hat (MLE)		33.22		nu star (bias corrected)			9.637				
155	MLE Mean (bias corrected)		0.00512		MLE Sd (bias corrected)			0.00467				
156												
157	Gamma Kaplan-Meier (KM) Statistics											
158	k hat (KM)		1.677		nu hat (KM)			23.47				
159	Approximate Chi Square Value (23.47, α)		13.45		Adjusted Chi Square Value (23.47, β)			11.23				

	A	B	C	D	E	F	G	H	I	J	K	L
160	95% Gamma Approximate KM-UCL (use when n>=50)					0.00586	95% Gamma Adjusted KM-UCL (use when n<50)					0.00703
161												
162	Gamma ROS Statistics using Imputed Non-Detects											
163	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
164	GROS may not be used when kstar of detected data is small such as < 0.1											
165	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
166	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
167	Minimum					0.00181	Mean					0.00721
168	Maximum					0.01	Median					0.00756
169	SD					0.00313	CV					0.434
170	k hat (MLE)					4.093	k star (bias corrected MLE)					2.434
171	Theta hat (MLE)					0.00176	Theta star (bias corrected MLE)					0.00296
172	nu hat (MLE)					57.31	nu star (bias corrected)					34.08
173	MLE Mean (bias corrected)					0.00721	MLE Sd (bias corrected)					0.00462
174							Adjusted Level of Significance (β)					0.0158
175	Approximate Chi Square Value (34.08, α)					21.73	Adjusted Chi Square Value (34.08, β)					18.81
176	95% Gamma Approximate UCL (use when n>=50)					0.0113	95% Gamma Adjusted UCL (use when n<50)					N/A
177												
178	Lognormal GOF Test on Detected Observations Only											
179	Shapiro Wilk Test Statistic					0.863	Shapiro Wilk GOF Test					
180	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Lognormal at 5% Significance Level					
181	Lilliefors Test Statistic					0.302	Lilliefors GOF Test					
182	5% Lilliefors Critical Value					0.443	Detected Data appear Lognormal at 5% Significance Level					
183	Detected Data appear Lognormal at 5% Significance Level											
184												
185	Lognormal ROS Statistics Using Imputed Non-Detects											
186	Mean in Original Scale					0.00329	Mean in Log Scale					-6.125
187	SD in Original Scale					0.00287	SD in Log Scale					1.024
188	95% t UCL (assumes normality of ROS data)					0.0054	95% Percentile Bootstrap UCL					0.00505
189	95% BCA Bootstrap UCL					0.00512	95% Bootstrap t UCL					0.00562
190	95% H-UCL (Log ROS)					0.0179						
191												
192	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
193	KM Mean (logged)					-6.042	95% H-UCL (KM -Log)					0.0107
194	KM SD (logged)					0.85	95% Critical H Value (KM-Log)					3.286
195	KM Standard Error of Mean (logged)					0.371						
196												
197	DL/2 Statistics											
198	DL/2 Normal						DL/2 Log-Transformed					
199	Mean in Original Scale					0.00315	Mean in Log Scale					-6.336
200	SD in Original Scale					0.00302	SD in Log Scale					1.251
201	95% t UCL (Assumes normality)					0.00536	95% H-Stat UCL					0.0373
202	DL/2 is not a recommended method, provided for comparisons and historical reasons											
203												
204	Nonparametric Distribution Free UCL Statistics											
205	Detected Data appear Normal Distributed at 5% Significance Level											
206												
207	Suggested UCL to Use											
208	95% KM (t) UCL					0.00556	95% KM (Percentile Bootstrap) UCL					N/A
209	Warning: One or more Recommended UCL(s) not available!											
210												
211	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
212	Recommendations are based upon data size, data distribution, and skewness.											

	A	B	C	D	E	F	G	H	I	J	K	L
213	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
214	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
215												
216	2,4-Dinitrotoluene											
217												
218	General Statistics											
219	Total Number of Observations			13		Number of Distinct Observations			13			
220	Number of Detects			4		Number of Non-Detects			9			
221	Number of Distinct Detects			4		Number of Distinct Non-Detects			9			
222	Minimum Detect			0.249		Minimum Non-Detect			0.083			
223	Maximum Detect			3.18		Maximum Non-Detect			0.104			
224	Variance Detects			2.043		Percent Non-Detects			69.23%			
225	Mean Detects			1.536		SD Detects			1.429			
226	Median Detects			1.357		CV Detects			0.931			
227	Skewness Detects			0.317		Kurtosis Detects			-4.047			
228	Mean of Logged Detects			-0.0616		SD of Logged Detects			1.243			
229												
230	Normal GOF Test on Detects Only											
231	Shapiro Wilk Test Statistic			0.881		Shapiro Wilk GOF Test						
232	5% Shapiro Wilk Critical Value			0.748		Detected Data appear Normal at 5% Significance Level						
233	Lilliefors Test Statistic			0.28		Lilliefors GOF Test						
234	5% Lilliefors Critical Value			0.443		Detected Data appear Normal at 5% Significance Level						
235	Detected Data appear Normal at 5% Significance Level											
236												
237	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
238	Mean		0.53		Standard Error of Mean			0.307				
239	SD		0.96		95% KM (BCA) UCL			N/A				
240	95% KM (t) UCL		1.078		95% KM (Percentile Bootstrap) UCL			N/A				
241	95% KM (z) UCL		1.035		95% KM Bootstrap t UCL			N/A				
242	90% KM Chebyshev UCL		1.452		95% KM Chebyshev UCL			1.87				
243	97.5% KM Chebyshev UCL		2.449		99% KM Chebyshev UCL			3.588				
244												
245	Gamma GOF Tests on Detected Observations Only											
246	A-D Test Statistic		0.404		Anderson-Darling GOF Test							
247	5% A-D Critical Value		0.665		Detected data appear Gamma Distributed at 5% Significance Level							
248	K-S Test Statistic		0.286		Kolmogrov-Smirnoff GOF							
249	5% K-S Critical Value		0.402		Detected data appear Gamma Distributed at 5% Significance Level							
250	Detected data appear Gamma Distributed at 5% Significance Level											
251												
252	Gamma Statistics on Detected Data Only											
253	k hat (MLE)		1.158		k star (bias corrected MLE)			0.456				
254	Theta hat (MLE)		1.326		Theta star (bias corrected MLE)			3.367				
255	nu hat (MLE)		9.262		nu star (bias corrected)			3.649				
256	MLE Mean (bias corrected)		1.536		MLE Sd (bias corrected)			2.274				
257												
258	Gamma Kaplan-Meier (KM) Statistics											
259	k hat (KM)		0.305		nu hat (KM)			7.928				
260	Approximate Chi Square Value (7.93, α)			2.694		Adjusted Chi Square Value (7.93, β)			2.278			
261	95% Gamma Approximate KM-UCL (use when $n \geq 50$)			1.56		95% Gamma Adjusted KM-UCL (use when $n < 50$)			1.844			
262												
263	Gamma ROS Statistics using Imputed Non-Detects											
264	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
265	GROS may not be used when kstar of detected data is small such as < 0.1											

	A	B	C	D	E	F	G	H	I	J	K	L
266	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
267	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
268		Minimum	0.01							Mean	0.479	
269		Maximum	3.18							Median	0.01	
270		SD	1.024							CV	2.135	
271		k hat (MLE)	0.282							k star (bias corrected MLE)	0.268	
272		Theta hat (MLE)	1.701							Theta star (bias corrected MLE)	1.788	
273		nu hat (MLE)	7.327							nu star (bias corrected)	6.97	
274		MLE Mean (bias corrected)	0.479							MLE Sd (bias corrected)	0.926	
275										Adjusted Level of Significance (β)	0.0301	
276		Approximate Chi Square Value (6.97, α)	2.154							Adjusted Chi Square Value (6.97, β)	1.793	
277		95% Gamma Approximate UCL (use when $n \geq 50$)	1.551							95% Gamma Adjusted UCL (use when $n < 50$)	N/A	
278												
279	Lognormal GOF Test on Detected Observations Only											
280		Shapiro Wilk Test Statistic	0.888							Shapiro Wilk GOF Test		
281		5% Shapiro Wilk Critical Value	0.748							Detected Data appear Lognormal at 5% Significance Level		
282		Lilliefors Test Statistic	0.262							Lilliefors GOF Test		
283		5% Lilliefors Critical Value	0.443							Detected Data appear Lognormal at 5% Significance Level		
284	Detected Data appear Lognormal at 5% Significance Level											
285												
286	Lognormal ROS Statistics Using Imputed Non-Detects											
287		Mean in Original Scale	0.479							Mean in Log Scale	-3.297	
288		SD in Original Scale	1.024							SD in Log Scale	2.329	
289		95% t UCL (assumes normality of ROS data)	0.985							95% Percentile Bootstrap UCL	0.981	
290		95% BCA Bootstrap UCL	1.17							95% Bootstrap t UCL	3.769	
291		95% H-UCL (Log ROS)	22.78									
292												
293	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
294		KM Mean (logged)	-1.742							95% H-UCL (KM -Log)	1.332	
295		KM SD (logged)	1.27							95% Critical H Value (KM-Log)	3.337	
296		KM Standard Error of Mean (logged)	0.407									
297												
298	DL/2 Statistics											
299		DL/2 Normal						DL/2 Log-Transformed				
300		Mean in Original Scale	0.506							Mean in Log Scale	-2.112	
301		SD in Original Scale	1.01							SD in Log Scale	1.553	
302		95% t UCL (Assumes normality)	1.006							95% H-Stat UCL	2.306	
303	DL/2 is not a recommended method, provided for comparisons and historical reasons											
304												
305	Nonparametric Distribution Free UCL Statistics											
306	Detected Data appear Normal Distributed at 5% Significance Level											
307												
308	Suggested UCL to Use											
309		95% KM (t) UCL	1.078							95% KM (Percentile Bootstrap) UCL	N/A	
310	Warning: One or more Recommended UCL(s) not available!											
311												
312	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
313	Recommendations are based upon data size, data distribution, and skewness.											
314	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
315	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
316												
317	2,6_Dinitrotoluene											
318												

	A	B	C	D	E	F	G	H	I	J	K	L
319	General Statistics											
320	Total Number of Observations				7		Number of Distinct Observations				7	
321	Number of Detects				1		Number of Non-Detects				6	
322	Number of Distinct Detects				1		Number of Distinct Non-Detects				6	
323												
324	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
325	s suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BT											
326												
327	The data set for variable 2,6_Dinitrotoluene was not processed!											
328												
329												
330	2,4,6_Trinitrotoluene											
331												
332	General Statistics											
333	Total Number of Observations				13		Number of Distinct Observations				13	
334	Number of Detects				3		Number of Non-Detects				10	
335	Number of Distinct Detects				3		Number of Distinct Non-Detects				10	
336	Minimum Detect				0.131		Minimum Non-Detect				0.083	
337	Maximum Detect				0.527		Maximum Non-Detect				0.104	
338	Variance Detects				0.0392		Percent Non-Detects				76.92%	
339	Mean Detects				0.328		SD Detects				0.198	
340	Median Detects				0.327		CV Detects				0.603	
341	Skewness Detects				0.0303		Kurtosis Detects				N/A	
342	Mean of Logged Detects				-1.264		SD of Logged Detects				0.707	
343												
344	Warning: Data set has only 3 Detected Values.											
345	This is not enough to compute meaningful or reliable statistics and estimates.											
346												
347												
348	Normal GOF Test on Detects Only											
349	Shapiro Wilk Test Statistic				1		Shapiro Wilk GOF Test					
350	5% Shapiro Wilk Critical Value				0.767		Detected Data appear Normal at 5% Significance Level					
351	Lilliefors Test Statistic				0.175		Lilliefors GOF Test					
352	5% Lilliefors Critical Value				0.512		Detected Data appear Normal at 5% Significance Level					
353	Detected Data appear Normal at 5% Significance Level											
354												
355	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
356	Mean		0.14		Standard Error of Mean				0.0439			
357	SD		0.129		95% KM (BCA) UCL				N/A			
358	95% KM (t) UCL		0.218		95% KM (Percentile Bootstrap) UCL				N/A			
359	95% KM (z) UCL		0.212		95% KM Bootstrap t UCL				N/A			
360	90% KM Chebyshev UCL		0.271		95% KM Chebyshev UCL				0.331			
361	97.5% KM Chebyshev UCL		0.414		99% KM Chebyshev UCL				0.577			
362												
363	Gamma GOF Tests on Detected Observations Only											
364	Not Enough Data to Perform GOF Test											
365												
366	Gamma Statistics on Detected Data Only											
367	k hat (MLE)		3.493		k star (bias corrected MLE)				N/A			
368	Theta hat (MLE)		0.094		Theta star (bias corrected MLE)				N/A			
369	nu hat (MLE)		20.96		nu star (bias corrected)				N/A			
370	MLE Mean (bias corrected)		N/A		MLE Sd (bias corrected)				N/A			
371												

	A	B	C	D	E	F	G	H	I	J	K	L
372	Gamma Kaplan-Meier (KM) Statistics											
373	k hat (KM)				1.166		nu hat (KM)				30.32	
374							Adjusted Level of Significance (β)				0.0301	
375	Approximate Chi Square Value (30.32, α)				18.74		Adjusted Chi Square Value (30.32, β)				17.46	
376	95% Gamma Approximate KM-UCL (use when $n \geq 50$)				0.226		95% Gamma Adjusted KM-UCL (use when $n < 50$)				0.242	
377												
378	Lognormal GOF Test on Detected Observations Only											
379	Shapiro Wilk Test Statistic				0.968		Shapiro Wilk GOF Test					
380	5% Shapiro Wilk Critical Value				0.767		Detected Data appear Lognormal at 5% Significance Level					
381	Lilliefors Test Statistic				0.248		Lilliefors GOF Test					
382	5% Lilliefors Critical Value				0.512		Detected Data appear Lognormal at 5% Significance Level					
383	Detected Data appear Lognormal at 5% Significance Level											
384												
385	Lognormal ROS Statistics Using Imputed Non-Detects											
386	Mean in Original Scale				0.0841		Mean in Log Scale				-3.776	
387	SD in Original Scale				0.161		SD in Log Scale				1.461	
388	95% t UCL (assumes normality of ROS data)				0.164		95% Percentile Bootstrap UCL				N/A	
389	95% BCA Bootstrap UCL				N/A		95% Bootstrap t UCL				N/A	
390	95% H-UCL (Log ROS)				0.318							
391												
392	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
393	KM Mean (logged)				-2.206		95% H-UCL (KM -Log)				0.19	
394	KM SD (logged)				0.586		95% Critical H Value (KM-Log)				2.217	
395	KM Standard Error of Mean (logged)				0.199							
396												
397	DL/2 Statistics											
398	DL/2 Normal						DL/2 Log-Transformed					
399	Mean in Original Scale				0.113		Mean in Log Scale				-2.615	
400	SD in Original Scale				0.147		SD in Log Scale				0.824	
401	95% t UCL (Assumes normality)				0.186		95% H-Stat UCL				0.189	
402	DL/2 is not a recommended method, provided for comparisons and historical reasons											
403												
404	Nonparametric Distribution Free UCL Statistics											
405	Detected Data appear Normal Distributed at 5% Significance Level											
406												
407	Suggested UCL to Use											
408	95% KM (t) UCL				0.218		95% KM (Percentile Bootstrap) UCL				N/A	
409	Warning: One or more Recommended UCL(s) not available!											
410												
411	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
412	Recommendations are based upon data size, data distribution, and skewness.											
413	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
414	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
415												
416	HMX											
417												
418	General Statistics											
419	Total Number of Observations				13		Number of Distinct Observations				12	
420	Number of Detects				2		Number of Non-Detects				11	
421	Number of Distinct Detects				2		Number of Distinct Non-Detects				10	
422	Minimum Detect				0.224		Minimum Non-Detect				0.0964	
423	Maximum Detect				0.836		Maximum Non-Detect				0.104	
424	Variance Detects				0.187		Percent Non-Detects				84.62%	

	A	B	C	D	E	F	G	H	I	J	K	L
425				Mean Detects		0.53					SD Detects	0.433
426				Median Detects		0.53					CV Detects	0.817
427				Skewness Detects		N/A					Kurtosis Detects	N/A
428				Mean of Logged Detects		-0.838					SD of Logged Detects	0.931
429												
430	Warning: Data set has only 2 Detected Values.											
431	This is not enough to compute meaningful or reliable statistics and estimates.											
432												
433												
434	Normal GOF Test on Detects Only											
435	Not Enough Data to Perform GOF Test											
436												
437	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
438				Mean		0.163					Standard Error of Mean	0.0773
439				SD		0.197					95% KM (BCA) UCL	N/A
440				95% KM (t) UCL		0.301					95% KM (Percentile Bootstrap) UCL	N/A
441				95% KM (z) UCL		0.29					95% KM Bootstrap t UCL	N/A
442				90% KM Chebyshev UCL		0.395					95% KM Chebyshev UCL	0.5
443				97.5% KM Chebyshev UCL		0.646					99% KM Chebyshev UCL	0.933
444												
445	Gamma GOF Tests on Detected Observations Only											
446	Not Enough Data to Perform GOF Test											
447												
448	Gamma Statistics on Detected Data Only											
449				k hat (MLE)		2.621					k star (bias corrected MLE)	N/A
450				Theta hat (MLE)		0.202					Theta star (bias corrected MLE)	N/A
451				nu hat (MLE)		10.48					nu star (bias corrected)	N/A
452				MLE Mean (bias corrected)		N/A					MLE Sd (bias corrected)	N/A
453												
454	Gamma Kaplan-Meier (KM) Statistics											
455				k hat (KM)		0.684					nu hat (KM)	17.79
456											Adjusted Level of Significance (β)	0.0301
457				Approximate Chi Square Value (17.79, α)		9.24					Adjusted Chi Square Value (17.79, β)	8.374
458				95% Gamma Approximate KM-UCL (use when $n \geq 50$)		0.314					95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.347
459												
460	Lognormal GOF Test on Detected Observations Only											
461	Not Enough Data to Perform GOF Test											
462												
463	Lognormal ROS Statistics Using Imputed Non-Detects											
464				Mean in Original Scale		0.0827					Mean in Log Scale	-5.857
465				SD in Original Scale		0.235					SD in Log Scale	2.309
466				95% t UCL (assumes normality of ROS data)		0.199					95% Percentile Bootstrap UCL	0.198
467				95% BCA Bootstrap UCL		0.275					95% Bootstrap t UCL	21.58
468				95% H-UCL (Log ROS)		1.579						
469												
470	DL/2 Statistics											
471	DL/2 Normal						DL/2 Log-Transformed					
472				Mean in Original Scale		0.124					Mean in Log Scale	-2.664
473				SD in Original Scale		0.219					SD in Log Scale	0.854
474				95% t UCL (Assumes normality)		0.232					95% H-Stat UCL	0.191
475	DL/2 is not a recommended method, provided for comparisons and historical reasons											
476												
477	Nonparametric Distribution Free UCL Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
478	Data do not follow a Discernible Distribution at 5% Significance Level											
479												
480	Suggested UCL to Use											
481	95% KM (t) UCL			0.301			95% KM (% Bootstrap) UCL			N/A		
482	Warning: One or more Recommended UCL(s) not available!											
483												
484	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
485	Recommendations are based upon data size, data distribution, and skewness.											
486	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
487	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
488												
489	RDX											
490												
491	General Statistics											
492	Total Number of Observations			7			Number of Distinct Observations			7		
493	Number of Detects			1			Number of Non-Detects			6		
494	Number of Distinct Detects			1			Number of Distinct Non-Detects			6		
495												
496	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
497	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BT)											
498												
499	The data set for variable RDX was not processed!											
500												
501												
502	Nitroglycerin											
503												
504	General Statistics											
505	Total Number of Observations			17			Number of Distinct Observations			17		
506	Number of Detects			15			Number of Non-Detects			2		
507	Number of Distinct Detects			15			Number of Distinct Non-Detects			2		
508	Minimum Detect			0.741			Minimum Non-Detect			0.0964		
509	Maximum Detect			53.1			Maximum Non-Detect			0.103		
510	Variance Detects			184.5			Percent Non-Detects			11.76%		
511	Mean Detects			16.25			SD Detects			13.58		
512	Median Detects			13.2			CV Detects			0.836		
513	Skewness Detects			1.464			Kurtosis Detects			2.839		
514	Mean of Logged Detects			2.358			SD of Logged Detects			1.131		
515												
516	Normal GOF Test on Detects Only											
517	Shapiro Wilk Test Statistic			0.88			Shapiro Wilk GOF Test					
518	5% Shapiro Wilk Critical Value			0.881			Detected Data Not Normal at 5% Significance Level					
519	Lilliefors Test Statistic			0.166			Lilliefors GOF Test					
520	5% Lilliefors Critical Value			0.229			Detected Data appear Normal at 5% Significance Level					
521	Detected Data appear Approximate Normal at 5% Significance Level											
522												
523	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
524	Mean			14.35			Standard Error of Mean			3.359		
525	SD			13.38			95% KM (BCA) UCL			19.94		
526	95% KM (t) UCL			20.21			95% KM (Percentile Bootstrap) UCL			20.09		
527	95% KM (z) UCL			19.87			95% KM Bootstrap t UCL			22.16		
528	90% KM Chebyshev UCL			24.42			95% KM Chebyshev UCL			28.99		
529	97.5% KM Chebyshev UCL			35.32			99% KM Chebyshev UCL			47.77		
530												

	A	B	C	D	E	F	G	H	I	J	K	L
531	Gamma GOF Tests on Detected Observations Only											
532	A-D Test Statistic			0.262		Anderson-Darling GOF Test						
533	5% A-D Critical Value			0.757		Detected data appear Gamma Distributed at 5% Significance Level						
534	K-S Test Statistic			0.165		Kolmogrov-Smirnoff GOF						
535	5% K-S Critical Value			0.226		Detected data appear Gamma Distributed at 5% Significance Level						
536	Detected data appear Gamma Distributed at 5% Significance Level											
537												
538	Gamma Statistics on Detected Data Only											
539	k hat (MLE)			1.306		k star (bias corrected MLE)			1.089			
540	Theta hat (MLE)			12.44		Theta star (bias corrected MLE)			14.92			
541	nu hat (MLE)			39.17		nu star (bias corrected)			32.67			
542	MLE Mean (bias corrected)			16.25		MLE Sd (bias corrected)			15.57			
543												
544	Gamma Kaplan-Meier (KM) Statistics											
545	k hat (KM)			1.15		nu hat (KM)			39.08			
546	Approximate Chi Square Value (39.08, α)			25.76		Adjusted Chi Square Value (39.08, β)			24.63			
547	95% Gamma Approximate KM-UCL (use when $n \geq 50$)			21.76		95% Gamma Adjusted KM-UCL (use when $n < 50$)			22.76			
548												
549	Gamma ROS Statistics using Imputed Non-Detects											
550	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
551	GROS may not be used when kstar of detected data is small such as < 0.1											
552	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
553	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
554	Minimum			0.01		Mean			14.34			
555	Maximum			53.1		Median			11.1			
556	SD			13.8		CV			0.963			
557	k hat (MLE)			0.556		k star (bias corrected MLE)			0.497			
558	Theta hat (MLE)			25.78		Theta star (bias corrected MLE)			28.83			
559	nu hat (MLE)			18.91		nu star (bias corrected)			16.91			
560	MLE Mean (bias corrected)			14.34		MLE Sd (bias corrected)			20.33			
561						Adjusted Level of Significance (β)			0.0346			
562	Approximate Chi Square Value (16.91, α)			8.605		Adjusted Chi Square Value (16.91, β)			7.989			
563	95% Gamma Approximate UCL (use when $n \geq 50$)			28.16		95% Gamma Adjusted UCL (use when $n < 50$)			30.33			
564												
565	Lognormal GOF Test on Detected Observations Only											
566	Shapiro Wilk Test Statistic			0.912		Shapiro Wilk GOF Test						
567	5% Shapiro Wilk Critical Value			0.881		Detected Data appear Lognormal at 5% Significance Level						
568	Lilliefors Test Statistic			0.23		Lilliefors GOF Test						
569	5% Lilliefors Critical Value			0.229		Detected Data Not Lognormal at 5% Significance Level						
570	Detected Data appear Approximate Lognormal at 5% Significance Level											
571												
572	Lognormal ROS Statistics Using Imputed Non-Detects											
573	Mean in Original Scale			14.44		Mean in Log Scale			2.067			
574	SD in Original Scale			13.69		SD in Log Scale			1.34			
575	95% t UCL (assumes normality of ROS data)			20.24		95% Percentile Bootstrap UCL			20.18			
576	95% BCA Bootstrap UCL			21.31		95% Bootstrap t UCL			22.36			
577	95% H-UCL (Log ROS)			56.89								
578												
579	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
580	KM Mean (logged)			1.806		95% H-UCL (KM -Log)			208.4			
581	KM SD (logged)			1.829		95% Critical H Value (KM-Log)			4.072			
582	KM Standard Error of Mean (logged)			0.459								
583												

	A	B	C	D	E	F	G	H	I	J	K	L
584	DL/2 Statistics											
585	DL/2 Normal						DL/2 Log-Transformed					
586	Mean in Original Scale				14.34		Mean in Log Scale				1.728	
587	SD in Original Scale				13.8		SD in Log Scale				2.07	
588	95% t UCL (Assumes normality)				20.18		95% H-Stat UCL				496.9	
589	DL/2 is not a recommended method, provided for comparisons and historical reasons											
590												
591	Nonparametric Distribution Free UCL Statistics											
592	Detected Data appear Approximate Normal Distributed at 5% Significance Level											
593												
594	Suggested UCL to Use											
595	95% KM (t) UCL				20.21		95% KM (Percentile Bootstrap) UCL				20.09	
596												
597	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
598	Recommendations are based upon data size, data distribution, and skewness.											
599	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
600	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
601												
602	Mercury											
603												
604	General Statistics											
605	Total Number of Observations				7		Number of Distinct Observations				5	
606	Number of Detects				2		Number of Non-Detects				5	
607	Number of Distinct Detects				2		Number of Distinct Non-Detects				3	
608	Minimum Detect				0.019		Minimum Non-Detect				0.015	
609	Maximum Detect				0.027		Maximum Non-Detect				0.017	
610	Variance Detects				3.2000E-5		Percent Non-Detects				71.43%	
611	Mean Detects				0.023		SD Detects				0.00566	
612	Median Detects				0.023		CV Detects				0.246	
613	Skewness Detects				N/A		Kurtosis Detects				N/A	
614	Mean of Logged Detects				-3.788		SD of Logged Detects				0.248	
615												
616	Warning: Data set has only 2 Detected Values.											
617	This is not enough to compute meaningful or reliable statistics and estimates.											
618												
619												
620	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
621	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
622	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
623	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0											
624												
625	Normal GOF Test on Detects Only											
626	Not Enough Data to Perform GOF Test											
627												
628	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
629	Mean		0.0173		Standard Error of Mean				0.00224			
630	SD		0.0042		95% KM (BCA) UCL				N/A			
631	95% KM (t) UCL		0.0216		95% KM (Percentile Bootstrap) UCL				N/A			
632	95% KM (z) UCL		0.021		95% KM Bootstrap t UCL				N/A			
633	90% KM Chebyshev UCL		0.024		95% KM Chebyshev UCL				0.0271			
634	97.5% KM Chebyshev UCL		0.0313		99% KM Chebyshev UCL				0.0396			
635												
636	Gamma GOF Tests on Detected Observations Only											

	A	B	C	D	E	F	G	H	I	J	K	L
637	Not Enough Data to Perform GOF Test											
638												
639	Gamma Statistics on Detected Data Only											
640	k hat (MLE)			32.73			k star (bias corrected MLE)			N/A		
641	Theta hat (MLE)			7.0281E-4			Theta star (bias corrected MLE)			N/A		
642	nu hat (MLE)			130.9			nu star (bias corrected)			N/A		
643	MLE Mean (bias corrected)			N/A			MLE Sd (bias corrected)			N/A		
644												
645	Gamma Kaplan-Meier (KM) Statistics											
646	k hat (KM)			16.95			nu hat (KM)			237.2		
647							Adjusted Level of Significance (β)			0.0158		
648	Approximate Chi Square Value (237.24, α)			202.6			Adjusted Chi Square Value (237.24, β)			192.9		
649	95% Gamma Approximate KM-UCL (use when $n \geq 50$)			0.0202			95% Gamma Adjusted KM-UCL (use when $n < 50$)			0.0213		
650												
651	Lognormal GOF Test on Detected Observations Only											
652	Not Enough Data to Perform GOF Test											
653												
654	Lognormal ROS Statistics Using Imputed Non-Detects											
655	Mean in Original Scale			0.0116			Mean in Log Scale			-4.645		
656	SD in Original Scale			0.00828			SD in Log Scale			0.64		
657	95% t UCL (assumes normality of ROS data)			0.0177			95% Percentile Bootstrap UCL			0.0166		
658	95% BCA Bootstrap UCL			0.0173			95% Bootstrap t UCL			0.0328		
659	95% H-UCL (Log ROS)			0.0243								
660												
661	DL/2 Statistics											
662	DL/2 Normal						DL/2 Log-Transformed					
663	Mean in Original Scale			0.0123			Mean in Log Scale			-4.532		
664	SD in Original Scale			0.00768			SD in Log Scale			0.519		
665	95% t UCL (Assumes normality)			0.0179			95% H-Stat UCL			0.0209		
666	DL/2 is not a recommended method, provided for comparisons and historical reasons											
667												
668	Nonparametric Distribution Free UCL Statistics											
669	Data do not follow a Discernible Distribution at 5% Significance Level											
670												
671	Suggested UCL to Use											
672	95% KM (t) UCL			0.0216			95% KM (% Bootstrap) UCL			N/A		
673	Warning: One or more Recommended UCL(s) not available!											
674												
675	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
676	Recommendations are based upon data size, data distribution, and skewness.											
677	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
678	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
679												
680	Diethyl phthalate											
681												
682	General Statistics											
683	Total Number of Observations			13			Number of Distinct Observations			10		
684	Number of Detects			7			Number of Non-Detects			6		
685	Number of Distinct Detects			7			Number of Distinct Non-Detects			3		
686	Minimum Detect			0.17			Minimum Non-Detect			0.067		
687	Maximum Detect			1.2			Maximum Non-Detect			0.086		
688	Variance Detects			0.113			Percent Non-Detects			46.15%		
689	Mean Detects			0.584			SD Detects			0.336		

	A	B	C	D	E	F	G	H	I	J	K	L		
743	Lognormal GOF Test on Detected Observations Only													
744	Shapiro Wilk Test Statistic				0.981		Shapiro Wilk GOF Test							
745	5% Shapiro Wilk Critical Value				0.803		Detected Data appear Lognormal at 5% Significance Level							
746	Lilliefors Test Statistic				0.155		Lilliefors GOF Test							
747	5% Lilliefors Critical Value				0.335		Detected Data appear Lognormal at 5% Significance Level							
748	Detected Data appear Lognormal at 5% Significance Level													
749														
750	Lognormal ROS Statistics Using Imputed Non-Detects													
751	Mean in Original Scale				0.358		Mean in Log Scale				-1.489			
752	SD in Original Scale				0.349		SD in Log Scale				1.033			
753	95% t UCL (assumes normality of ROS data)				0.53		95% Percentile Bootstrap UCL				0.521			
754	95% BCA Bootstrap UCL				0.551		95% Bootstrap t UCL				0.597			
755	95% H-UCL (Log ROS)				0.914									
756														
757	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed													
758	KM Mean (logged)				-1.619		95% H-UCL (KM -Log)				0.922			
759	KM SD (logged)				1.089		95% Critical H Value (KM-Log)				3.005			
760	KM Standard Error of Mean (logged)				0.326									
761														
762	DL/2 Statistics													
763	DL/2 Normal						DL/2 Log-Transformed							
764	Mean in Original Scale				0.331		Mean in Log Scale				-1.915			
765	SD in Original Scale				0.371		SD in Log Scale				1.448			
766	95% t UCL (Assumes normality)				0.514		95% H-Stat UCL				1.955			
767	DL/2 is not a recommended method, provided for comparisons and historical reasons													
768														
769	Nonparametric Distribution Free UCL Statistics													
770	Detected Data appear Normal Distributed at 5% Significance Level													
771														
772	Suggested UCL to Use													
773	95% KM (t) UCL			0.529			95% KM (Percentile Bootstrap) UCL			0.521				
774														
775	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.													
776	Recommendations are based upon data size, data distribution, and skewness.													
777	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).													
778	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.													
779														
780	Dimethyl phthalate													
781														
782	General Statistics													
783	Total Number of Observations				13		Number of Distinct Observations				9			
784	Number of Detects				2		Number of Non-Detects				11			
785	Number of Distinct Detects				2		Number of Distinct Non-Detects				7			
786	Minimum Detect				0.15		Minimum Non-Detect				0.068			
787	Maximum Detect				0.33		Maximum Non-Detect				0.09			
788	Variance Detects				0.0162		Percent Non-Detects				84.62%			
789	Mean Detects				0.24		SD Detects				0.127			
790	Median Detects				0.24		CV Detects				0.53			
791	Skewness Detects				N/A		Kurtosis Detects				N/A			
792	Mean of Logged Detects				-1.503		SD of Logged Detects				0.558			
793														
794	Warning: Data set has only 2 Detected Values.													
795	This is not enough to compute meaningful or reliable statistics and estimates.													

	A	B	C	D	E	F	G	H	I	J	K	L
796												
797												
798	Normal GOF Test on Detects Only											
799	Not Enough Data to Perform GOF Test											
800												
801	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
802		Mean	0.0945					Standard Error of Mean				0.028
803		SD	0.0714					95% KM (BCA) UCL				N/A
804		95% KM (t) UCL	0.144					95% KM (Percentile Bootstrap) UCL				N/A
805		95% KM (z) UCL	0.141					95% KM Bootstrap t UCL				N/A
806		90% KM Chebyshev UCL	0.178					95% KM Chebyshev UCL				0.217
807		97.5% KM Chebyshev UCL	0.269					99% KM Chebyshev UCL				0.373
808												
809	Gamma GOF Tests on Detected Observations Only											
810	Not Enough Data to Perform GOF Test											
811												
812	Gamma Statistics on Detected Data Only											
813		k hat (MLE)	6.761					k star (bias corrected MLE)				N/A
814		Theta hat (MLE)	0.0355					Theta star (bias corrected MLE)				N/A
815		nu hat (MLE)	27.04					nu star (bias corrected)				N/A
816		MLE Mean (bias corrected)	N/A					MLE Sd (bias corrected)				N/A
817												
818	Gamma Kaplan-Meier (KM) Statistics											
819		k hat (KM)	1.751					nu hat (KM)				45.51
820								Adjusted Level of Significance (β)				0.0301
821		Approximate Chi Square Value (45.51, α)	31.04					Adjusted Chi Square Value (45.51, β)				29.34
822		95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.139					95% Gamma Adjusted KM-UCL (use when $n < 50$)				0.147
823												
824	Lognormal GOF Test on Detected Observations Only											
825	Not Enough Data to Perform GOF Test											
826												
827	Lognormal ROS Statistics Using Imputed Non-Detects											
828		Mean in Original Scale	0.0439					Mean in Log Scale				-4.528
829		SD in Original Scale	0.0947					SD in Log Scale				1.537
830		95% t UCL (assumes normality of ROS data)	0.0907					95% Percentile Bootstrap UCL				0.0909
831		95% BCA Bootstrap UCL	0.114					95% Bootstrap t UCL				0.573
832		95% H-UCL (Log ROS)	0.194									
833												
834	DL/2 Statistics											
835		DL/2 Normal						DL/2 Log-Transformed				
836		Mean in Original Scale	0.068					Mean in Log Scale				-3.03
837		SD in Original Scale	0.0848					SD in Log Scale				0.702
838		95% t UCL (Assumes normality)	0.11					95% H-Stat UCL				0.1
839	DL/2 is not a recommended method, provided for comparisons and historical reasons											
840												
841	Nonparametric Distribution Free UCL Statistics											
842	Data do not follow a Discernible Distribution at 5% Significance Level											
843												
844	Suggested UCL to Use											
845		95% KM (t) UCL	0.144					95% KM (% Bootstrap) UCL				N/A
846	Warning: One or more Recommended UCL(s) not available!											
847												
848	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
849	Recommendations are based upon data size, data distribution, and skewness.											
850	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
851	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
852												
853	Fluoranthene											
854												
855	General Statistics											
856	Total Number of Observations			7		Number of Distinct Observations			6			
857	Number of Detects			6		Number of Non-Detects			1			
858	Number of Distinct Detects			5		Number of Distinct Non-Detects			1			
859	Minimum Detect			0.004		Minimum Non-Detect			0.003			
860	Maximum Detect			0.076		Maximum Non-Detect			0.003			
861	Variance Detects			8.2297E-4		Percent Non-Detects			14.29%			
862	Mean Detects			0.0208		SD Detects			0.0287			
863	Median Detects			0.0055		CV Detects			1.377			
864	Skewness Detects			1.937		Kurtosis Detects			3.59			
865	Mean of Logged Detects			-4.559		SD of Logged Detects			1.208			
866												
867	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
868	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
869	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
870	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0											
871												
872	Normal GOF Test on Detects Only											
873	Shapiro Wilk Test Statistic			0.686		Shapiro Wilk GOF Test						
874	5% Shapiro Wilk Critical Value			0.788		Detected Data Not Normal at 5% Significance Level						
875	Lilliefors Test Statistic			0.364		Lilliefors GOF Test						
876	5% Lilliefors Critical Value			0.362		Detected Data Not Normal at 5% Significance Level						
877	Detected Data Not Normal at 5% Significance Level											
878												
879	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
880	Mean			0.0183		Standard Error of Mean			0.0104			
881	SD			0.025		95% KM (BCA) UCL			0.0353			
882	95% KM (t) UCL			0.0384		95% KM (Percentile Bootstrap) UCL			0.0353			
883	95% KM (z) UCL			0.0353		95% KM Bootstrap t UCL			0.378			
884	90% KM Chebyshev UCL			0.0494		95% KM Chebyshev UCL			0.0635			
885	97.5% KM Chebyshev UCL			0.083		99% KM Chebyshev UCL			0.121			
886												
887	Gamma GOF Tests on Detected Observations Only											
888	A-D Test Statistic			0.81		Anderson-Darling GOF Test						
889	5% A-D Critical Value			0.718		Detected Data Not Gamma Distributed at 5% Significance Level						
890	K-S Test Statistic			0.382		Kolmogrov-Smirnoff GOF						
891	5% K-S Critical Value			0.342		Detected Data Not Gamma Distributed at 5% Significance Level						
892	Detected Data Not Gamma Distributed at 5% Significance Level											
893												
894	Gamma Statistics on Detected Data Only											
895	k hat (MLE)			0.856		k star (bias corrected MLE)			0.539			
896	Theta hat (MLE)			0.0243		Theta star (bias corrected MLE)			0.0386			
897	nu hat (MLE)			10.27		nu star (bias corrected)			6.469			
898	MLE Mean (bias corrected)			0.0208		MLE Sd (bias corrected)			0.0284			
899												
900	Gamma Kaplan-Meier (KM) Statistics											
901	k hat (KM)			0.533		nu hat (KM)			7.469			

	A	B	C	D	E	F	G	H	I	J	K	L
902	Approximate Chi Square Value (7.47, α)					2.431	Adjusted Chi Square Value (7.47, β)					1.656
903	95% Gamma Approximate KM-UCL (use when $n \geq 50$)					0.0562	95% Gamma Adjusted KM-UCL (use when $n < 50$)					0.0825
904												
905	Gamma ROS Statistics using Imputed Non-Detects											
906	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
907	GROS may not be used when kstar of detected data is small such as < 0.1											
908	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
909	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
910	Minimum					0.004	Mean					0.0193
911	Maximum					0.076	Median					0.006
912	SD					0.0265	CV					1.374
913	k hat (MLE)					0.942	k star (bias corrected MLE)					0.634
914	Theta hat (MLE)					0.0205	Theta star (bias corrected MLE)					0.0304
915	nu hat (MLE)					13.19	nu star (bias corrected)					8.872
916	MLE Mean (bias corrected)					0.0193	MLE Sd (bias corrected)					0.0242
917							Adjusted Level of Significance (β)					0.0158
918	Approximate Chi Square Value (8.87, α)					3.25	Adjusted Chi Square Value (8.87, β)					2.312
919	95% Gamma Approximate UCL (use when $n \geq 50$)					0.0526	95% Gamma Adjusted UCL (use when $n < 50$)					0.074
920												
921	Lognormal GOF Test on Detected Observations Only											
922	Shapiro Wilk Test Statistic					0.791	Shapiro Wilk GOF Test					
923	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
924	Lilliefors Test Statistic					0.344	Lilliefors GOF Test					
925	5% Lilliefors Critical Value					0.362	Detected Data appear Lognormal at 5% Significance Level					
926	Detected Data appear Lognormal at 5% Significance Level											
927												
928	Lognormal ROS Statistics Using Imputed Non-Detects											
929	Mean in Original Scale					0.0179	Mean in Log Scale					-4.966
930	SD in Original Scale					0.0273	SD in Log Scale					1.541
931	95% t UCL (assumes normality of ROS data)					0.038	95% Percentile Bootstrap UCL					0.0351
932	95% BCA Bootstrap UCL					0.0389	95% Bootstrap t UCL					0.206
933	95% H-UCL (Log ROS)					0.646						
934												
935	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
936	KM Mean (logged)					-4.737	95% H-UCL (KM -Log)					0.1
937	KM SD (logged)					1.111	95% Critical H Value (KM-Log)					4.015
938	KM Standard Error of Mean (logged)					0.46						
939												
940	DL/2 Statistics											
941	DL/2 Normal						DL/2 Log-Transformed					
942	Mean in Original Scale					0.0181	Mean in Log Scale					-4.836
943	SD in Original Scale					0.0272	SD in Log Scale					1.325
944	95% t UCL (Assumes normality)					0.038	95% H-Stat UCL					0.236
945	DL/2 is not a recommended method, provided for comparisons and historical reasons											
946												
947	Nonparametric Distribution Free UCL Statistics											
948	Detected Data appear Lognormal Distributed at 5% Significance Level											
949												
950	Suggested UCL to Use											
951	97.5% KM (Chebyshev) UCL					0.083						
952	Warning: Recommended UCL exceeds the maximum observation											
953												
954	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											

	A	B	C	D	E	F	G	H	I	J	K	L
955	Recommendations are based upon data size, data distribution, and skewness.											
956	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
957	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
958												
959	Naphthalene											
960												
961	General Statistics											
962	Total Number of Observations			7		Number of Distinct Observations			4			
963	Number of Detects			3		Number of Non-Detects			4			
964	Number of Distinct Detects			3		Number of Distinct Non-Detects			1			
965	Minimum Detect			0.005		Minimum Non-Detect			0.003			
966	Maximum Detect			0.034		Maximum Non-Detect			0.003			
967	Variance Detects			2.6233E-4		Percent Non-Detects			57.14%			
968	Mean Detects			0.0153		SD Detects			0.0162			
969	Median Detects			0.007		CV Detects			1.056			
970	Skewness Detects			1.702		Kurtosis Detects			N/A			
971	Mean of Logged Detects			-4.547		SD of Logged Detects			1.024			
972												
973	Warning: Data set has only 3 Detected Values.											
974	This is not enough to compute meaningful or reliable statistics and estimates.											
975												
976												
977	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
978	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
979	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
980	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0											
981												
982	Normal GOF Test on Detects Only											
983	Shapiro Wilk Test Statistic			0.801		Shapiro Wilk GOF Test						
984	5% Shapiro Wilk Critical Value			0.767		Detected Data appear Normal at 5% Significance Level						
985	Lilliefors Test Statistic			0.363		Lilliefors GOF Test						
986	5% Lilliefors Critical Value			0.512		Detected Data appear Normal at 5% Significance Level						
987	Detected Data appear Normal at 5% Significance Level											
988												
989	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
990	Mean			0.00829		Standard Error of Mean			0.0049			
991	SD			0.0106		95% KM (BCA) UCL			N/A			
992	95% KM (t) UCL			0.0178		95% KM (Percentile Bootstrap) UCL			N/A			
993	95% KM (z) UCL			0.0164		95% KM Bootstrap t UCL			N/A			
994	90% KM Chebyshev UCL			0.023		95% KM Chebyshev UCL			0.0297			
995	97.5% KM Chebyshev UCL			0.0389		99% KM Chebyshev UCL			0.0571			
996												
997	Gamma GOF Tests on Detected Observations Only											
998	Not Enough Data to Perform GOF Test											
999												
1000	Gamma Statistics on Detected Data Only											
1001	k hat (MLE)			1.498		k star (bias corrected MLE)			N/A			
1002	Theta hat (MLE)			0.0102		Theta star (bias corrected MLE)			N/A			
1003	nu hat (MLE)			8.989		nu star (bias corrected)			N/A			
1004	MLE Mean (bias corrected)			N/A		MLE Sd (bias corrected)			N/A			
1005												
1006	Gamma Kaplan-Meier (KM) Statistics											
1007	k hat (KM)			0.612		nu hat (KM)			8.566			

	A	B	C	D	E	F	G	H	I	J	K	L
1008							Adjusted Level of Significance (β)				0.0158	
1009	Approximate Chi Square Value (8.57, α)					3.067	Adjusted Chi Square Value (8.57, β)				2.164	
1010	95% Gamma Approximate KM-UCL (use when $n \geq 50$)					0.0231	95% Gamma Adjusted KM-UCL (use when $n < 50$)				0.0328	
1011												
1012	Lognormal GOF Test on Detected Observations Only											
1013	Shapiro Wilk Test Statistic					0.877	Shapiro Wilk GOF Test					
1014	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
1015	Lilliefors Test Statistic					0.324	Lilliefors GOF Test					
1016	5% Lilliefors Critical Value					0.512	Detected Data appear Lognormal at 5% Significance Level					
1017	Detected Data appear Lognormal at 5% Significance Level											
1018												
1019	Lognormal ROS Statistics Using Imputed Non-Detects											
1020	Mean in Original Scale					0.00682	Mean in Log Scale					-6.637
1021	SD in Original Scale					0.0123	SD in Log Scale					2.208
1022	95% t UCL (assumes normality of ROS data)					0.0158	95% Percentile Bootstrap UCL					0.015
1023	95% BCA Bootstrap UCL					0.0166	95% Bootstrap t UCL					0.0347
1024	95% H-UCL (Log ROS)					11.94						
1025												
1026	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
1027	KM Mean (logged)					-5.268	95% H-UCL (KM -Log)					0.0218
1028	KM SD (logged)					0.83	95% Critical H Value (KM-Log)					3.234
1029	KM Standard Error of Mean (logged)					0.384						
1030												
1031	DL/2 Statistics											
1032	DL/2 Normal						DL/2 Log-Transformed					
1033	Mean in Original Scale					0.00743	Mean in Log Scale					-5.664
1034	SD in Original Scale					0.0119	SD in Log Scale					1.201
1035	95% t UCL (Assumes normality)					0.0162	95% H-Stat UCL					0.058
1036	DL/2 is not a recommended method, provided for comparisons and historical reasons											
1037												
1038	Nonparametric Distribution Free UCL Statistics											
1039	Detected Data appear Normal Distributed at 5% Significance Level											
1040												
1041	Suggested UCL to Use											
1042	95% KM (t) UCL				0.0178	95% KM (Percentile Bootstrap) UCL				N/A		
1043	Warning: One or more Recommended UCL(s) not available!											
1044												
1045	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1046	Recommendations are based upon data size, data distribution, and skewness.											
1047	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1048	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1049												
1050	Benzo(a)anthracene											
1051												
1052	General Statistics											
1053	Total Number of Observations					7	Number of Distinct Observations					3
1054	Number of Detects					2	Number of Non-Detects					5
1055	Number of Distinct Detects					2	Number of Distinct Non-Detects					1
1056	Minimum Detect					0.005	Minimum Non-Detect					0.003
1057	Maximum Detect					0.027	Maximum Non-Detect					0.003
1058	Variance Detects					2.4200E-4	Percent Non-Detects					71.43%
1059	Mean Detects					0.016	SD Detects					0.0156
1060	Median Detects					0.016	CV Detects					0.972

	A	B	C	D	E	F	G	H	I	J	K	L
1061				Skewness Detects		N/A					Kurtosis Detects	N/A
1062				Mean of Logged Detects		-4.455					SD of Logged Detects	1.192
1063												
1064	Warning: Data set has only 2 Detected Values.											
1065	This is not enough to compute meaningful or reliable statistics and estimates.											
1066												
1067												
1068	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1069	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1070	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0											
1071												
1072												
1073	Normal GOF Test on Detects Only											
1074	Not Enough Data to Perform GOF Test											
1075												
1076	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1077				Mean		0.00671					Standard Error of Mean	0.00444
1078				SD		0.00831					95% KM (BCA) UCL	N/A
1079				95% KM (t) UCL		0.0153					95% KM (Percentile Bootstrap) UCL	N/A
1080				95% KM (z) UCL		0.014					95% KM Bootstrap t UCL	N/A
1081				90% KM Chebyshev UCL		0.02					95% KM Chebyshev UCL	0.0261
1082				97.5% KM Chebyshev UCL		0.0345					99% KM Chebyshev UCL	0.0509
1083												
1084	Gamma GOF Tests on Detected Observations Only											
1085	Not Enough Data to Perform GOF Test											
1086												
1087	Gamma Statistics on Detected Data Only											
1088				k hat (MLE)		1.71					k star (bias corrected MLE)	N/A
1089				Theta hat (MLE)		0.00935					Theta star (bias corrected MLE)	N/A
1090				nu hat (MLE)		6.842					nu star (bias corrected)	N/A
1091				MLE Mean (bias corrected)		N/A					MLE Sd (bias corrected)	N/A
1092												
1093	Gamma Kaplan-Meier (KM) Statistics											
1094				k hat (KM)		0.653					nu hat (KM)	9.139
1095											Adjusted Level of Significance (β)	0.0158
1096				Approximate Chi Square Value (9.14, α)		3.411					Adjusted Chi Square Value (9.14, β)	2.443
1097				95% Gamma Approximate KM-UCL (use when $n \geq 50$)		0.018					95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.0251
1098												
1099	Lognormal GOF Test on Detected Observations Only											
1100	Not Enough Data to Perform GOF Test											
1101												
1102	Lognormal ROS Statistics Using Imputed Non-Detects											
1103				Mean in Original Scale		0.00466					Mean in Log Scale	-8.65
1104				SD in Original Scale		0.01					SD in Log Scale	3.401
1105				95% t UCL (assumes normality of ROS data)		0.012					95% Percentile Bootstrap UCL	0.0117
1106				95% BCA Bootstrap UCL		0.0154					95% Bootstrap t UCL	0.302
1107				95% H-UCL (Log ROS)		339269						
1108												
1109	DL/2 Statistics											
1110	DL/2 Normal						DL/2 Log-Transformed					
1111				Mean in Original Scale		0.00564					Mean in Log Scale	-5.917
1112				SD in Original Scale		0.00951					SD in Log Scale	1.111
1113				95% t UCL (Assumes normality)		0.0126					95% H-Stat UCL	0.0309

	A	B	C	D	E	F	G	H	I	J	K	L
1114	DL/2 is not a recommended method, provided for comparisons and historical reasons											
1115												
1116	Nonparametric Distribution Free UCL Statistics											
1117	Data do not follow a Discernible Distribution at 5% Significance Level											
1118												
1119	Suggested UCL to Use											
1120	95% KM (BCA) UCL			N/A								
1121	Warning: One or more Recommended UCL(s) not available!											
1122												
1123	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1124	Recommendations are based upon data size, data distribution, and skewness.											
1125	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1126	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1127												
1128	bis(2-Ethylhexyl)phthalate											
1129												
1130	General Statistics											
1131	Total Number of Observations			13			Number of Distinct Observations			11		
1132	Number of Detects			5			Number of Non-Detects			8		
1133	Number of Distinct Detects			5			Number of Distinct Non-Detects			6		
1134	Minimum Detect			0.082			Minimum Non-Detect			0.067		
1135	Maximum Detect			0.7			Maximum Non-Detect			0.086		
1136	Variance Detects			0.0515			Percent Non-Detects			61.54%		
1137	Mean Detects			0.38			SD Detects			0.227		
1138	Median Detects			0.34			CV Detects			0.596		
1139	Skewness Detects			0.228			Kurtosis Detects			0.714		
1140	Mean of Logged Detects			-1.173			SD of Logged Detects			0.808		
1141												
1142	Normal GOF Test on Detects Only											
1143	Shapiro Wilk Test Statistic			0.981			Shapiro Wilk GOF Test					
1144	5% Shapiro Wilk Critical Value			0.762			Detected Data appear Normal at 5% Significance Level					
1145	Lilliefors Test Statistic			0.178			Lilliefors GOF Test					
1146	5% Lilliefors Critical Value			0.396			Detected Data appear Normal at 5% Significance Level					
1147	Detected Data appear Normal at 5% Significance Level											
1148												
1149	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1150	Mean			0.188			Standard Error of Mean			0.0613		
1151	SD			0.198			95% KM (BCA) UCL			0.29		
1152	95% KM (t) UCL			0.297			95% KM (Percentile Bootstrap) UCL			0.287		
1153	95% KM (z) UCL			0.288			95% KM Bootstrap t UCL			0.289		
1154	90% KM Chebyshev UCL			0.372			95% KM Chebyshev UCL			0.455		
1155	97.5% KM Chebyshev UCL			0.57			99% KM Chebyshev UCL			0.797		
1156												
1157	Gamma GOF Tests on Detected Observations Only											
1158	A-D Test Statistic			0.3			Anderson-Darling GOF Test					
1159	5% A-D Critical Value			0.683			Detected data appear Gamma Distributed at 5% Significance Level					
1160	K-S Test Statistic			0.258			Kolmogrov-Smirnoff GOF					
1161	5% K-S Critical Value			0.36			Detected data appear Gamma Distributed at 5% Significance Level					
1162	Detected data appear Gamma Distributed at 5% Significance Level											
1163												
1164	Gamma Statistics on Detected Data Only											
1165	k hat (MLE)			2.582			k star (bias corrected MLE)			1.166		
1166	Theta hat (MLE)			0.147			Theta star (bias corrected MLE)			0.326		

	A	B	C	D	E	F	G	H	I	J	K	L	
1167					nu hat (MLE)	25.82					nu star (bias corrected)	11.66	
1168					MLE Mean (bias corrected)	0.38					MLE Sd (bias corrected)	0.352	
1169													
1170	Gamma Kaplan-Meier (KM) Statistics												
1171					k hat (KM)	0.902					nu hat (KM)	23.46	
1172					Approximate Chi Square Value (23.46, α)		13.44			Adjusted Chi Square Value (23.46, β)		12.37	
1173					95% Gamma Approximate KM-UCL (use when $n \geq 50$)		0.328			95% Gamma Adjusted KM-UCL (use when $n < 50$)		0.356	
1174													
1175	Gamma ROS Statistics using Imputed Non-Detects												
1176	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs												
1177	GROS may not be used when kstar of detected data is small such as < 0.1												
1178	For such situations, GROS method tends to yield inflated values of UCLs and BTVs												
1179	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates												
1180					Minimum	0.01					Mean	0.152	
1181					Maximum	0.7					Median	0.01	
1182					SD	0.229					CV	1.5	
1183					k hat (MLE)	0.459					k star (bias corrected MLE)	0.404	
1184					Theta hat (MLE)	0.332					Theta star (bias corrected MLE)	0.377	
1185					nu hat (MLE)	11.92					nu star (bias corrected)	10.5	
1186					MLE Mean (bias corrected)	0.152					MLE Sd (bias corrected)	0.24	
1187											Adjusted Level of Significance (β)	0.0301	
1188					Approximate Chi Square Value (10.50, α)		4.259			Adjusted Chi Square Value (10.50, β)		3.71	
1189					95% Gamma Approximate UCL (use when $n \geq 50$)		0.376			95% Gamma Adjusted UCL (use when $n < 50$)		0.432	
1190													
1191	Lognormal GOF Test on Detected Observations Only												
1192					Shapiro Wilk Test Statistic	0.89					Shapiro Wilk GOF Test		
1193					5% Shapiro Wilk Critical Value	0.762					Detected Data appear Lognormal at 5% Significance Level		
1194					Lilliefors Test Statistic	0.301					Lilliefors GOF Test		
1195					5% Lilliefors Critical Value	0.396					Detected Data appear Lognormal at 5% Significance Level		
1196	Detected Data appear Lognormal at 5% Significance Level												
1197													
1198	Lognormal ROS Statistics Using Imputed Non-Detects												
1199					Mean in Original Scale	0.164					Mean in Log Scale	-2.664	
1200					SD in Original Scale	0.221					SD in Log Scale	1.345	
1201					95% t UCL (assumes normality of ROS data)		0.273			95% Percentile Bootstrap UCL		0.27	
1202					95% BCA Bootstrap UCL		0.284			95% Bootstrap t UCL		0.337	
1203					95% H-UCL (Log ROS)		0.665						
1204													
1205	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed												
1206					KM Mean (logged)	-2.112					95% H-UCL (KM -Log)	0.341	
1207					KM SD (logged)	0.868					95% Critical H Value (KM-Log)	2.627	
1208					KM Standard Error of Mean (logged)		0.269						
1209													
1210	DL/2 Statistics												
1211					DL/2 Normal						DL/2 Log-Transformed		
1212					Mean in Original Scale	0.168					Mean in Log Scale	-2.504	
1213					SD in Original Scale	0.218					SD in Log Scale	1.193	
1214					95% t UCL (Assumes normality)		0.276			95% H-Stat UCL		0.5	
1215	DL/2 is not a recommended method, provided for comparisons and historical reasons												
1216													
1217	Nonparametric Distribution Free UCL Statistics												
1218	Detected Data appear Normal Distributed at 5% Significance Level												
1219													

	A	B	C	D	E	F	G	H	I	J	K	L
1220	Suggested UCL to Use											
1221	95% KM (t) UCL				0.297		95% KM (Percentile Bootstrap) UCL				0.287	
1222												
1223	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1224	Recommendations are based upon data size, data distribution, and skewness.											
1225	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1226	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1227												
1228	Di-n-butyl phthalate											
1229												
1230	General Statistics											
1231	Total Number of Observations				13		Number of Distinct Observations				13	
1232	Number of Detects				12		Number of Non-Detects				1	
1233	Number of Distinct Detects				12		Number of Distinct Non-Detects				1	
1234	Minimum Detect				0.12		Minimum Non-Detect				0.086	
1235	Maximum Detect				20		Maximum Non-Detect				0.086	
1236	Variance Detects				31.18		Percent Non-Detects				7.692%	
1237	Mean Detects				2.423		SD Detects				5.584	
1238	Median Detects				0.51		CV Detects				2.305	
1239	Skewness Detects				3.361		Kurtosis Detects				11.46	
1240	Mean of Logged Detects				-0.278		SD of Logged Detects				1.362	
1241												
1242	Normal GOF Test on Detects Only											
1243	Shapiro Wilk Test Statistic				0.434		Shapiro Wilk GOF Test					
1244	5% Shapiro Wilk Critical Value				0.859		Detected Data Not Normal at 5% Significance Level					
1245	Lilliefors Test Statistic				0.418		Lilliefors GOF Test					
1246	5% Lilliefors Critical Value				0.256		Detected Data Not Normal at 5% Significance Level					
1247	Detected Data Not Normal at 5% Significance Level											
1248												
1249	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1250	Mean		2.243		Standard Error of Mean				1.499			
1251	SD		5.174		95% KM (BCA) UCL				5.186			
1252	95% KM (t) UCL				4.914		95% KM (Percentile Bootstrap) UCL				5.16	
1253	95% KM (z) UCL				4.708		95% KM Bootstrap t UCL				19.63	
1254	90% KM Chebyshev UCL				6.739		95% KM Chebyshev UCL				8.776	
1255	97.5% KM Chebyshev UCL				11.6		99% KM Chebyshev UCL				17.16	
1256												
1257	Gamma GOF Tests on Detected Observations Only											
1258	A-D Test Statistic		1.296		Anderson-Darling GOF Test							
1259	5% A-D Critical Value		0.782		Detected Data Not Gamma Distributed at 5% Significance Level							
1260	K-S Test Statistic		0.265		Kolmogrov-Smirnoff GOF							
1261	5% K-S Critical Value		0.258		Detected Data Not Gamma Distributed at 5% Significance Level							
1262	Detected Data Not Gamma Distributed at 5% Significance Level											
1263												
1264	Gamma Statistics on Detected Data Only											
1265	k hat (MLE)		0.54		k star (bias corrected MLE)				0.461			
1266	Theta hat (MLE)		4.486		Theta star (bias corrected MLE)				5.26			
1267	nu hat (MLE)		12.96		nu star (bias corrected)				11.05			
1268	MLE Mean (bias corrected)				2.423		MLE Sd (bias corrected)				3.57	
1269												
1270	Gamma Kaplan-Meier (KM) Statistics											
1271	k hat (KM)		0.188		nu hat (KM)				4.886			
1272	Approximate Chi Square Value (4.89, α)				1.1		Adjusted Chi Square Value (4.89, β)				0.869	

	A	B	C	D	E	F	G	H	I	J	K	L
1273	95% Gamma Approximate KM-UCL (use when n>=50)					9.964	95% Gamma Adjusted KM-UCL (use when n<50)					12.61
1274												
1275	Gamma ROS Statistics using Imputed Non-Detects											
1276	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1277	GROS may not be used when kstar of detected data is small such as < 0.1											
1278	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
1279	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1280	Minimum					0.01	Mean					2.237
1281	Maximum					20	Median					0.48
1282	SD					5.388	CV					2.409
1283	k hat (MLE)					0.455	k star (bias corrected MLE)					0.402
1284	Theta hat (MLE)					4.913	Theta star (bias corrected MLE)					5.571
1285	nu hat (MLE)					11.84	nu star (bias corrected)					10.44
1286	MLE Mean (bias corrected)					2.237	MLE Sd (bias corrected)					3.53
1287							Adjusted Level of Significance (β)					0.0301
1288	Approximate Chi Square Value (10.44, α)					4.218	Adjusted Chi Square Value (10.44, β)					3.672
1289	95% Gamma Approximate UCL (use when n>=50)					5.536	95% Gamma Adjusted UCL (use when n<50)					6.36
1290												
1291	Lognormal GOF Test on Detected Observations Only											
1292	Shapiro Wilk Test Statistic					0.918	Shapiro Wilk GOF Test					
1293	5% Shapiro Wilk Critical Value					0.859	Detected Data appear Lognormal at 5% Significance Level					
1294	Lilliefors Test Statistic					0.181	Lilliefors GOF Test					
1295	5% Lilliefors Critical Value					0.256	Detected Data appear Lognormal at 5% Significance Level					
1296	Detected Data appear Lognormal at 5% Significance Level											
1297												
1298	Lognormal ROS Statistics Using Imputed Non-Detects											
1299	Mean in Original Scale					2.238	Mean in Log Scale					-0.527
1300	SD in Original Scale					5.387	SD in Log Scale					1.584
1301	95% t UCL (assumes normality of ROS data)					4.901	95% Percentile Bootstrap UCL					5.124
1302	95% BCA Bootstrap UCL					6.803	95% Bootstrap t UCL					18.97
1303	95% H-UCL (Log ROS)					12.51						
1304												
1305	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
1306	KM Mean (logged)					-0.445	95% H-UCL (KM -Log)					6.83
1307	KM SD (logged)					1.38	95% Critical H Value (KM-Log)					3.548
1308	KM Standard Error of Mean (logged)					0.4						
1309												
1310	DL/2 Statistics											
1311	DL/2 Normal						DL/2 Log-Transformed					
1312	Mean in Original Scale					2.239	Mean in Log Scale					-0.498
1313	SD in Original Scale					5.387	SD in Log Scale					1.527
1314	95% t UCL (Assumes normality)					4.902	95% H-Stat UCL					10.58
1315	DL/2 is not a recommended method, provided for comparisons and historical reasons											
1316												
1317	Nonparametric Distribution Free UCL Statistics											
1318	Detected Data appear Lognormal Distributed at 5% Significance Level											
1319												
1320	Suggested UCL to Use											
1321	97.5% KM (Chebyshev) UCL					11.6						
1322												
1323	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1324	Recommendations are based upon data size, data distribution, and skewness.											
1325	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
1326	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1327												
1328	Selenium											
1329												
1330	General Statistics											
1331	Total Number of Observations				13		Number of Distinct Observations				9	
1332	Number of Detects				1		Number of Non-Detects				12	
1333	Number of Distinct Detects				1		Number of Distinct Non-Detects				9	
1334												
1335	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
1336	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BT)											
1337												
1338	The data set for variable Selenium was not processed!											
1339												
1340												
1341	Silver											
1342												
1343	General Statistics											
1344	Total Number of Observations				7		Number of Distinct Observations				5	
1345	Number of Detects				5		Number of Non-Detects				2	
1346	Number of Distinct Detects				3		Number of Distinct Non-Detects				2	
1347	Minimum Detect				0.11		Minimum Non-Detect				0.096	
1348	Maximum Detect				0.29		Maximum Non-Detect				0.098	
1349	Variance Detects				0.00608		Percent Non-Detects				28.57%	
1350	Mean Detects				0.154		SD Detects				0.078	
1351	Median Detects				0.11		CV Detects				0.506	
1352	Skewness Detects				1.986		Kurtosis Detects				3.948	
1353	Mean of Logged Detects				-1.951		SD of Logged Detects				0.421	
1354												
1355	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1356	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1357	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1358	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0											
1359												
1360	Normal GOF Test on Detects Only											
1361	Shapiro Wilk Test Statistic				0.687		Shapiro Wilk GOF Test					
1362	5% Shapiro Wilk Critical Value				0.762		Detected Data Not Normal at 5% Significance Level					
1363	Lilliefors Test Statistic				0.32		Lilliefors GOF Test					
1364	5% Lilliefors Critical Value				0.396		Detected Data appear Normal at 5% Significance Level					
1365	Detected Data appear Approximate Normal at 5% Significance Level											
1366												
1367	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1368	Mean		0.137		Standard Error of Mean				0.0273			
1369	SD		0.0645		95% KM (BCA) UCL				N/A			
1370	95% KM (t) UCL		0.19		95% KM (Percentile Bootstrap) UCL				N/A			
1371	95% KM (z) UCL		0.182		95% KM Bootstrap t UCL				N/A			
1372	90% KM Chebyshev UCL		0.219		95% KM Chebyshev UCL				0.256			
1373	97.5% KM Chebyshev UCL		0.308		99% KM Chebyshev UCL				0.409			
1374												
1375	Gamma GOF Tests on Detected Observations Only											
1376	A-D Test Statistic		0.813		Anderson-Darling GOF Test							
1377	5% A-D Critical Value		0.68		Detected Data Not Gamma Distributed at 5% Significance Level							
1378	K-S Test Statistic		0.348		Kolmogrov-Smirnoff GOF							

	A	B	C	D	E	F	G	H	I	J	K	L
1379				5% K-S Critical Value		0.358	Detected data appear Gamma Distributed at 5% Significance Level					
1380	Detected data follow Appr. Gamma Distribution at 5% Significance Level											
1381												
1382	Gamma Statistics on Detected Data Only											
1383				k hat (MLE)		6.368					k star (bias corrected MLE)	2.681
1384				Theta hat (MLE)		0.0242					Theta star (bias corrected MLE)	0.0574
1385				nu hat (MLE)		63.68					nu star (bias corrected)	26.81
1386				MLE Mean (bias corrected)		0.154					MLE Sd (bias corrected)	0.0941
1387												
1388	Gamma Kaplan-Meier (KM) Statistics											
1389				k hat (KM)		4.539					nu hat (KM)	63.55
1390				Approximate Chi Square Value (63.55, α)		46.21					Adjusted Chi Square Value (63.55, β)	41.78
1391				95% Gamma Approximate KM-UCL (use when $n \geq 50$)		0.189					95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.209
1392												
1393	Gamma ROS Statistics using Imputed Non-Detects											
1394	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1395	GROS may not be used when kstar of detected data is small such as < 0.1											
1396	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
1397	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1398				Minimum		0.01					Mean	0.113
1399				Maximum		0.29					Median	0.11
1400				SD		0.0948					CV	0.84
1401				k hat (MLE)		1.083					k star (bias corrected MLE)	0.714
1402				Theta hat (MLE)		0.104					Theta star (bias corrected MLE)	0.158
1403				nu hat (MLE)		15.17					nu star (bias corrected)	10
1404				MLE Mean (bias corrected)		0.113					MLE Sd (bias corrected)	0.134
1405											Adjusted Level of Significance (β)	0.0158
1406				Approximate Chi Square Value (10.00, α)		3.942					Adjusted Chi Square Value (10.00, β)	2.881
1407				95% Gamma Approximate UCL (use when $n \geq 50$)		0.286					95% Gamma Adjusted UCL (use when $n < 50$)	0.392
1408												
1409	Lognormal GOF Test on Detected Observations Only											
1410				Shapiro Wilk Test Statistic		0.73					Shapiro Wilk GOF Test	
1411				5% Shapiro Wilk Critical Value		0.762					Detected Data Not Lognormal at 5% Significance Level	
1412				Lilliefors Test Statistic		0.328					Lilliefors GOF Test	
1413				5% Lilliefors Critical Value		0.396					Detected Data appear Lognormal at 5% Significance Level	
1414	Detected Data appear Approximate Lognormal at 5% Significance Level											
1415												
1416	Lognormal ROS Statistics Using Imputed Non-Detects											
1417				Mean in Original Scale		0.125					Mean in Log Scale	-2.238
1418				SD in Original Scale		0.0808					SD in Log Scale	0.598
1419				95% t UCL (assumes normality of ROS data)		0.184					95% Percentile Bootstrap UCL	N/A
1420				95% BCA Bootstrap UCL		N/A					95% Bootstrap t UCL	N/A
1421				95% H-UCL (Log ROS)		0.245						
1422												
1423	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
1424				KM Mean (logged)		-2.063					95% H-UCL (KM -Log)	0.19
1425				KM SD (logged)		0.364					95% Critical H Value (KM-Log)	2.276
1426				KM Standard Error of Mean (logged)		0.154						
1427												
1428	DL/2 Statistics											
1429	DL/2 Normal						DL/2 Log-Transformed					
1430				Mean in Original Scale		0.124					Mean in Log Scale	-2.258
1431				SD in Original Scale		0.0819					SD in Log Scale	0.627

	A	B	C	D	E	F	G	H	I	J	K	L	
1432			95% t UCL (Assumes normality)			0.184					95% H-Stat UCL	0.256	
1433	DL/2 is not a recommended method, provided for comparisons and historical reasons												
1434													
1435	Nonparametric Distribution Free UCL Statistics												
1436	Detected Data appear Approximate Normal Distributed at 5% Significance Level												
1437													
1438	Suggested UCL to Use												
1439			95% KM (t) UCL			0.19					95% KM (Percentile Bootstrap) UCL	N/A	
1440	Warning: One or more Recommended UCL(s) not available!												
1441													
1442	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.												
1443	Recommendations are based upon data size, data distribution, and skewness.												
1444	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).												
1445	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.												
1446													
1447													
1448	Dioxin/Furan												
1449													
1450	General Statistics												
1451			Total Number of Observations			13					Number of Distinct Observations	13	
1452											Number of Missing Observations	0	
1453			Minimum			0.43					Mean	2.948	
1454			Maximum			10.07					Median	1.82	
1455			SD			2.729					Std. Error of Mean	0.757	
1456			Coefficient of Variation			0.926					Skewness	1.779	
1457													
1458	Normal GOF Test												
1459			Shapiro Wilk Test Statistic			0.789					Shapiro Wilk GOF Test		
1460			5% Shapiro Wilk Critical Value			0.866					Data Not Normal at 5% Significance Level		
1461			Lilliefors Test Statistic			0.265					Lilliefors GOF Test		
1462			5% Lilliefors Critical Value			0.246					Data Not Normal at 5% Significance Level		
1463	Data Not Normal at 5% Significance Level												
1464													
1465	Assuming Normal Distribution												
1466			95% Normal UCL								95% UCLs (Adjusted for Skewness)		
1467			95% Student's-t UCL			4.297					95% Adjusted-CLT UCL (Chen-1995)	4.592	
1468											95% Modified-t UCL (Johnson-1978)	4.359	
1469													
1470	Gamma GOF Test												
1471			A-D Test Statistic			0.47					Anderson-Darling Gamma GOF Test		
1472			5% A-D Critical Value			0.75					Detected data appear Gamma Distributed at 5% Significance Level		
1473			K-S Test Statistic			0.207					Kolmogrov-Smirnoff Gamma GOF Test		
1474			5% K-S Critical Value			0.241					Detected data appear Gamma Distributed at 5% Significance Level		
1475	Detected data appear Gamma Distributed at 5% Significance Level												
1476													
1477	Gamma Statistics												
1478			k hat (MLE)			1.551					k star (bias corrected MLE)	1.244	
1479			Theta hat (MLE)			1.901					Theta star (bias corrected MLE)	2.369	
1480			nu hat (MLE)			40.33					nu star (bias corrected)	32.35	
1481			MLE Mean (bias corrected)			2.948					MLE Sd (bias corrected)	2.642	
1482											Approximate Chi Square Value (0.05)	20.35	
1483			Adjusted Level of Significance			0.0301					Adjusted Chi Square Value	19	
1484													

	A	B	C	D	E	F	G	H	I	J	K	L
1485	Assuming Gamma Distribution											
1486	95% Approximate Gamma UCL (use when n>=50)				4.686		95% Adjusted Gamma UCL (use when n<50)				5.018	
1487												
1488	Lognormal GOF Test											
1489	Shapiro Wilk Test Statistic				0.946		Shapiro Wilk Lognormal GOF Test					
1490	5% Shapiro Wilk Critical Value				0.866		Data appear Lognormal at 5% Significance Level					
1491	Lilliefors Test Statistic				0.19		Lilliefors Lognormal GOF Test					
1492	5% Lilliefors Critical Value				0.246		Data appear Lognormal at 5% Significance Level					
1493	Data appear Lognormal at 5% Significance Level											
1494												
1495	Lognormal Statistics											
1496	Minimum of Logged Data				-0.844		Mean of logged Data				0.725	
1497	Maximum of Logged Data				2.31		SD of logged Data				0.899	
1498												
1499	Assuming Lognormal Distribution											
1500	95% H-UCL				6.197		90% Chebyshev (MVUE) UCL				5.344	
1501	95% Chebyshev (MVUE) UCL				6.418		97.5% Chebyshev (MVUE) UCL				7.91	
1502	99% Chebyshev (MVUE) UCL				10.84							
1503												
1504	Nonparametric Distribution Free UCL Statistics											
1505	Data appear to follow a Discernible Distribution at 5% Significance Level											
1506												
1507	Nonparametric Distribution Free UCLs											
1508	95% CLT UCL				4.193		95% Jackknife UCL				4.297	
1509	95% Standard Bootstrap UCL				4.131		95% Bootstrap-t UCL				5.475	
1510	95% Hall's Bootstrap UCL				6.229		95% Percentile Bootstrap UCL				4.234	
1511	95% BCA Bootstrap UCL				4.478							
1512	90% Chebyshev(Mean, Sd) UCL				5.219		95% Chebyshev(Mean, Sd) UCL				6.247	
1513	97.5% Chebyshev(Mean, Sd) UCL				7.675		99% Chebyshev(Mean, Sd) UCL				10.48	
1514												
1515	Suggested UCL to Use											
1516	95% Adjusted Gamma UCL				5.018							
1517												
1518	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1519	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
1520	and Singh and Singh (2003). However, simulation results will not cover all Real World data sets.											
1521	For additional insight the user may want to consult a statistician.											
1522												

Appendix D

09/23/2015

11:43:27

OUTPUT FILE - C:\REAMS\OBG1.OUT

RISK EXPOSURE DEFAULT FILE USED - SYSTEM DEFAULTS

SETUP DEFAULT FILE USED - OBG RISK ASSESSMENT

FILE PARAMETER DEFAULT FILE USED - SYSTEM DEFAULTS

RISK ANALYSIS RESULTS

```

*****
*****
**
** TOTAL EXPOSURE RISK :          1.3829700E-5 **
** TOTAL HAZARD INDEX  :          0.2632782668 **
**
*****
*****

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***** TOTAL PATHWAY RISKS *****

MEDIA	HAZARD	RISK
SOIL	0.2632782668	1.3829700E-5
GROUND WATER	0.0000000000	0.0000000E+0
SURFACE WATER	0.0000000000	0.0000000E+0
FOOD	0.0000000000	0.0000000E+0
AIR	0.0000000000	0.0000000E+0

***** HAZARD/RISK RESULTS BY CHEMICAL *****

COMMERCIAL

CHEMICAL - DIPHENYLAMINE

MEDIA	HAZARD	RISK
TOTAL	0.0000510292	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000510292	0.000000000000000E+0

CHEMICAL - 2,4-DINITROTOLUENE

MEDIA	HAZARD	RISK
TOTAL	0.0006536298	1.448000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0006536298	1.448000000000000E-7

CHEMICAL - 2,6-DINITROTOLUENE		
MEDIA	HAZARD	RISK
TOTAL	0.0005054064	2.707000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0005054064	2.707000000000000E-7

CHEMICAL - 2,4,6-TRINITROTOLUENE		
MEDIA	HAZARD	RISK
TOTAL	0.0004230275	2.300000000000000E-9
SOIL INGESTION/CONTACT/INHALATION	0.0004230275	2.300000000000000E-9

CHEMICAL - OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCINE (HMX)		
MEDIA	HAZARD	RISK
TOTAL	0.0000052829	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000052829	0.000000000000000E+0

CHEMICAL - HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)		
MEDIA	HAZARD	RISK
TOTAL	0.0016009671	1.887000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0016009671	1.887000000000000E-7

CHEMICAL - NITROGLYCERINE		
MEDIA	HAZARD	RISK
TOTAL	0.2450808561	1.488000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.2450808561	1.488000000000000E-7

CHEMICAL - MERCURY (INORGANIC)		
MEDIA	HAZARD	RISK
TOTAL	0.0131509750	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0131509750	0.000000000000000E+0

CHEMICAL - DIETHYLPHTHALATE		
MEDIA	HAZARD	RISK

TOTAL	0.0000005897	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000005897	0.0000000000000000E+0

CHEMICAL - FLUORANTHENE

MEDIA	HAZARD	RISK
TOTAL	0.0000027382	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000027382	0.0000000000000000E+0

CHEMICAL - NAPHTHALENE

MEDIA	HAZARD	RISK
TOTAL	0.0007079683	2.5900000000000000E-8
SOIL INGESTION/CONTACT/INHALATION	0.0007079683	2.5900000000000000E-8

CHEMICAL - BENZ (A) ANTHRACENE

MEDIA	HAZARD	RISK
TOTAL	0.0000000000	1.0600000000000000E-8
SOIL INGESTION/CONTACT/INHALATION	0.0000000000	1.0600000000000000E-8

CHEMICAL - BIS (2-ETHYLHEXYL) PHTHALATE

MEDIA	HAZARD	RISK
TOTAL	0.0000180081	1.8000000000000000E-9
SOIL INGESTION/CONTACT/INHALATION	0.0000180081	1.8000000000000000E-9

CHEMICAL - DIBUTYLPHTHALATE

MEDIA	HAZARD	RISK
TOTAL	0.0001406699	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0001406699	0.0000000000000000E+0

CHEMICAL - SELENIUM

MEDIA	HAZARD	RISK
TOTAL	0.0000702881	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000702881	0.0000000000000000E+0

CHEMICAL - SILVER AND COMPOUNDS		
MEDIA	HAZARD	RISK
TOTAL	0.0000325342	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000325342	0.000000000000000E+0

CHEMICAL - DIOXIN		
MEDIA	HAZARD	RISK
TOTAL	0.0008274959	4.113000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0008274959	4.113000000000000E-7

CHEMICAL - PERCHLORATE		
MEDIA	HAZARD	RISK
TOTAL	0.0000068004	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000068004	0.000000000000000E+0

CHEMICAL - 3,3'-DIMETHYLBENZIDINE		
MEDIA	HAZARD	RISK
TOTAL	0.0000000000	1.262480000000000E-5
SOIL INGESTION/CONTACT/INHALATION	0.0000000000	1.262480000000000E-5

***** HAZARD/RISK RESULTS BY MEDIA *****

SOIL INGESTION - COMMERCIAL		
CHEMICAL	HAZARD	RISK
DIPHENYLAMINE	0.0000360274	0.000000000000000E+0
2,4-DINITROTOLUENE	0.0004614726	1.022000000000000E-7
2,6-DINITROTOLUENE	0.0003578767	1.917000000000000E-7
2,4,6-TRINITROTOLUENE	0.0003732877	2.000000000000000E-9
OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCI	0.0000051541	0.000000000000000E+0
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.0015068493	1.776000000000000E-7
NITROGLYCERINE	0.1730308219	1.051000000000000E-7
DIETHYLPHTHALATE	0.0000005661	0.000000000000000E+0
FLUORANTHENE	0.0000017765	0.000000000000000E+0
NAPHTHALENE	0.0000007620	1.000000000000000E-10

BENZ (A) ANTHRACENE	0.0000000000	6.000000000000001E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000127140	1.300000000000000E-9
DIBUTYLPHTHALATE	0.0000993151	0.000000000000000E+0
SELENIUM	0.0000702055	0.000000000000000E+0
SILVER AND COMPOUNDS	0.0000325342	0.000000000000000E+0
DIOXIN	0.0004296233	1.995000000000000E-7
PERCHLORATE	0.0000068004	0.000000000000000E+0
3,3'-DIMETHYLBENZIDINE	0.0000000000	8.913300000000002E-6

SOIL CONTACT - COMMERCIAL

CHEMICAL	HAZARD	RISK
DIPHENYLAMINE	0.0000150018	0.000000000000000E+0
2,4-DINITROTOLUENE	0.0001921572	4.250000000000000E-8
2,6-DINITROTOLUENE	0.0001475297	7.900000000000002E-8
2,4,6-TRINITROTOLUENE	0.0000497398	3.000000000000000E-10
OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCI	0.0000001288	0.000000000000000E+0
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.0000941178	1.110000000000000E-8
NITROGLYCERINE	0.0720500342	4.370000000000001E-8
DIETHYLPHTHALATE	0.0000000236	0.000000000000000E+0
FLUORANTHENE	0.0000009617	0.000000000000000E+0
NAPHTHALENE	0.0000004125	1.000000000000000E-10
BENZ (A) ANTHRACENE	0.0000000000	3.300000000000000E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000052941	5.000000000000000E-10
DIBUTYLPHTHALATE	0.0000413548	0.000000000000000E+0
DIOXIN	0.0000536685	2.490000000000000E-8
3,3'-DIMETHYLBENZIDINE	0.0000000000	3.711500000000000E-6

AIR INHALATION VIA SOIL - COMMERCIAL

CHEMICAL	HAZARD	RISK
2,4-DINITROTOLUENE	0.0000000000	1.000000000000000E-10
MERCURY (INORGANIC)	0.0131509750	0.000000000000000E+0
NAPHTHALENE	0.0007067938	2.570000000000000E-8
BENZ (A) ANTHRACENE	0.0000000000	1.300000000000000E-9
SELENIUM	0.0000000826	0.000000000000000E+0
DIOXIN	0.0003442041	1.869000000000000E-7

***** ACCEPTABLE CONCENTRATIONS *****

MEDIA	CONCENTRATIONS (mg/Kg) or (mg/L)	
	INITIAL	ACCEPTABLE

CHEMICAL: Arsenic		
Soil, Non-carcinogenic	0.0000000000	0.0000000000

Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Chromium III and compounds

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Chromium(VI)

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Diphenylamine

Soil, Non-carcinogenic	1.0520000000	20615.6475116208
Soil, Carcinogenic	1.0520000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000

Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,4-Dinitrotoluene		
Soil, Non-carcinogenic	1.0780000000	1649.2516100092
Soil, Carcinogenic	1.0780000000	7.4447513812
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,6-Dinitrotoluene		
Soil, Non-carcinogenic	0.4180000000	827.0571959516
Soil, Carcinogenic	0.4180000000	1.5441448098
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,4,6-Trinitrotoluene		
Soil, Non-carcinogenic	0.2180000000	515.3329275284
Soil, Carcinogenic	0.2180000000	94.7826086957
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000

Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Octahydro-1357-tetranitro-1357-tetrazocine (HMX)

Soil, Non-carcinogenic	0.3010000000	56976.2819663442
Soil, Carcinogenic	0.3010000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)

Soil, Non-carcinogenic	5.2800000000	3298.0065611592
Soil, Carcinogenic	5.2800000000	27.9809220986
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Nitroglycerine

Soil, Non-carcinogenic	20.2100000000	82.4625812134
Soil, Carcinogenic	20.2100000000	135.8198924731
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000

Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Mercury (inorganic)		
Soil, Non-carcinogenic	0.0216000000	1.6424637717
Soil, Carcinogenic	0.0216000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Diethylphthalate		
Soil, Non-carcinogenic	0.5290000000	897066.304900797
Soil, Carcinogenic	0.5290000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Dimethylphthalate		
Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000

Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Fluoranthene		
Soil, Non-carcinogenic	0.0830000000	30311.8837192316
Soil, Carcinogenic	0.0830000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Naphthalene		
Soil, Non-carcinogenic	0.0178000000	25.1423686626
Soil, Carcinogenic	0.0178000000	0.6872586873
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Benz(a)anthracene		
Soil, Non-carcinogenic	0.0270000000	0.0000000000
Soil, Carcinogenic	0.0270000000	2.5471698113
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Bis(2-ethylhexyl)phthalate

Soil, Non-carcinogenic	0.2970000000	16492.5783397471
Soil, Carcinogenic	0.2970000000	165.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Dibutylphthalate

Soil, Non-carcinogenic	11.6000000000	82462.5595098880
Soil, Carcinogenic	11.6000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Selenium

Soil, Non-carcinogenic	0.4100000000	5833.1353386989
Soil, Carcinogenic	0.4100000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Barium and compounds

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000

Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Silver and compounds		
Soil, Non-carcinogenic	0.1900000000	5840.0083604330
Soil, Carcinogenic	0.1900000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Cadmium and compounds		
Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Dioxin		
Soil, Non-carcinogenic	0.0000050180	0.0060640784
Soil, Carcinogenic	0.0000050180	0.0000122003
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000

Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Perchlorate

Soil, Non-carcinogenic	0.0055600000	817.5989647668
Soil, Carcinogenic	0.0055600000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: 3,3'-Dimethylbenzidine

Soil, Non-carcinogenic	2.6500000000	0.0000000000
Soil, Carcinogenic	2.6500000000	0.2099043153
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

***** CALCULATION ALGORITHMS *****

***** Hazard/Risk Associated with INGESTION via SOIL *****

Using the following Calculation :

$$CS \times IR \times CF \times EF \times ED$$

Intake (mg/Kg-day) = -----

BW x AT

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- IR is the Ingestion Rate (mgsoil/day)
- CF is the Conversion Factor (10 ^ -6 Kg/mg)
- EF is the Exposure Frequency (day/years)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CS	User Defined	User Defined	User Defined	User Defined
IR	200.00	114.28; 489.50 (M)	100.00	100.00
CF	0.000001	0.000001	0.000001	0.000001
EF	350	350	250	250
ED	6	Incl. in IR Adj.	25	25
BW	15	Incl. in IR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via SOIL *****

Using the following Calculation :

$$CS \times CF \times ABS \times EF \times (ED \times SA \times AF) \times DFS_{adj}$$

Intake (mg/Kg-day) = -----

BW x AT

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
 - CF is the Conversion Factor (10 ^ -6 Kg/mg)
 - SA is the Skin Surface Area for Contact (cm^2/event)
 - AF is the Soil to Skin Adherence Factor (unitless)
 - ABS is the Absorption Factor (unitless)
 - EF is the Exposure Frequency (day/years)
 - ED is the Exposure Duration (years)
 - DFS is the Residential soil dermal contact factor (mg-year/kg-day)
 - BW is the Body Weight (Kg)
 - AT is the Averaging Time (days)
- (RfDo modified for dermal exposure: RfDo x gastrointestinal absorption factor; CSFo modified for dermal exposure: CSFo/gastrointestinal absorption factor)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC

CS	User Defined	User Defined	User Defined	User Defined
CF	0.000001	0.000001	0.000001	0.000001
SA	2800	Incl. in DFSadj.	3470	3470
AF	0.12	0.07	0.12	0.12
ABS	User Defined	User Defined	User Defined	User Defined
EF	350	350	250	250
ED	6	Incl. in DFSadj.	25	25
DFSadj	Not Used	361; 1445 (M)	25	25
BW	15	Incl. in DFSadj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INHALATION OF PARTICULATES via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{ET} \times \text{EF} \times \text{ED} \times \left[\frac{1}{\text{VF}} + \frac{1}{\text{PEF}} \right] \times \text{CF}}{\text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the Exposure Duration (years) for non-carcinogens and carcinogens
- VF is the Volatilization factor (m³/Kg)
- PEF is the Particulate Emission Factor (m³/Kg)
- AT is the Averaging Time (days)
- CF is used only for carcinogenic calculation (µg/mg)
- ED is adjusted for mutagens as follows:
 [(IUR x 20)+(IUR x 12)+(IUR x 30)+(IUR x 14)]

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CS	User Defined	User Defined	User Defined	User Defined
ET	1.00	1.00	8.00	8.00
EF	350	350	250	250
ED	6	30; age-adj (M)	25	25
VF	0.5	0.5	0.5	0.5
PEF	1.36E+9	1.36E+9	1.36E+9	1.36E+9
AT	365 x 6	365 x 70	365 x 25	365 x 70
CF	-	1000	-	1000

***** Risk Associated with Vinyl Chloride via SOIL *****

Using the following Calculation :

Ingestion:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times (((\text{EF} \times \text{IF} \times \text{CF1})/\text{AT}) + ((\text{IR} \times \text{CF})/\text{BW}))$$

Inhalation:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times (((\text{EF} \times \text{ED} \times \text{ET} \times \text{CF2})/\text{AT} \times \text{VF}) + ((\text{CF2})/\text{VF}))$$

Dermal:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times (((\text{EF} \times \text{DFS} \times \text{ABS} \times \text{CF1})/\text{AT}) + ((\text{SA} \times \text{AF} \times \text{ABS} \times \text{CF1})/\text{BW}))$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- IFS is the adjusted soil ingestion rate (mg-yr/kg-d)
- IRS is the soil ingestion rate (mg/day)
- DFS is the adjusted soil dermal contact factor (mg-yr/kg-d)
- ABS is the absorption factor
- AF is the adherence factor (mg/cm2)
- BW is the body weight (kg)
- VF is the volatilization factor (m³/kg)
- AT is the Averaging Time (days)
- CF1 is the conversion factor (kg/mg)
- CF2 is the conversion factor (µg/mg)

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|-----|
| RESIDENTIAL |
| CARCINOGENIC |
|-----|

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CS User Defined
ET 1.00
EF 350
ED 30
IFS 114.28
IRS 200.00
DFS 361
ABS User Defined
AF 0.12
BW 15
VF 0.5
AT 365 x 6
CF1 0.000001
CF2 1000

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***** Hazard/Risk Associated with DRINKING WELL WATER *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CW} \times \text{IR} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- IR is the Ingestion Rate (Liters/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
IR	1.00	1.09; 3.39(M)	2.00	2.00
EF	350	350	250	250
ED	6	Incl. in IR Adj.	25	25
BW	15	Incl. in IR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Risk Associated with Vinyl Chloride via GROUNDWATER *****
 Using the following Calculation :

Ingestion:

$$\text{Intake (mg/Kg-day)} = \text{CW} \times ((\text{EF} \times \text{IF})/\text{AT}) + (\text{IR}/\text{BW})$$

where :

- CW is the Chemical Concentration in the Groundwater (mg/kg)
- EF is the Exposure Frequency (day/years)
- IF is the adjusted water ingestion rate (L-yr/kg-d)
- IR is the water ingestion rate (L/day)
- BW is the body weight (kg)
- AT is the Averaging Time (days)

	RESIDENTIAL	CARCINOGENIC
CW	User Defined	
EF	350	
IF	1.086	
IR	1.00	
BW	15	
AT	365 x 70	

***** Hazard/Risk Associated with DERMAL CONTACT via WELL WATER *****

Using the following Calculation :

$$\text{Intake} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- PC is the Dermal Permeability Constant (cm/hr)
- SA is the Surface Area Exposed (cm²)
- ET is the Exposure Time (hours/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- CF is the Volumetric Conversion (1 Liter/1000 cm³)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
PC	User Defined	User Defined	User Defined	User Defined
SA	7500	9200	820	820
ET	0.2	0.2	1.0	1.0
EF	350	350	250	250
ED	6	Incl. in SA Adj.	25	25
CF	.001	.001	.001	.001
BW	15	Incl. in SA Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INCIDENTAL INGESTION via SWIMMING *****

Using the following Calculation :

$$\text{Intake (mg/Kg/day)} = \frac{\text{CW} \times \text{CR} \times \text{EF} \times \text{ET} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- CR is the Contact Rate (Liters/hour)
- EF is the Exposure Frequency (events/year)
- ET is the Exposure Time (hours/event)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)

AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
CR	0.05	.037	0.05	0.05
EF	7	7	7	7
ET	2.6	2.6	2.6	2.6
ED	6	Incl. in CR Adj.	25	25
BW	15	Incl. in CR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via SURFACE WATER *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- PC is the Dermal Permeability Constant (cm/hr)
- SA is the Surface Area Exposed (cm²)
- ET is the Exposure Time (hours/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- CF is the Volumetric Conversion (1 Liter/1000 cm³)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
PC	User Defined	User Defined	User Defined	User Defined
SA	7500	9200	820	820
ET	2.6	2.6	2.6	2.6
EF	7	7	7	7
ED	6	Incl. in SA Adj.	25	25
CF	.001	.001	.001	.001
BW	15	Incl. in SA Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INHALATION via AIR *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CA} \times \text{ET} \times \text{EF} \times \text{ED}}{\text{AT} \times \text{CF}}$$

where :

- CA is the Chemical Concentration in Air (mg/m³)
- ET is the Exposure Time (hours/hour)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years) for non-carcinogens and carcinogens
- AT is the Averaging Time (days)
- CF is the conversion factor (µg/mg)
- ED is adjusted for mutagens as follows:
 [(IUR x 20)+(IUR x 12)+(IUR x 30)+(IUR x 14)]

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CA	User Defined	User Defined	User Defined	User Defined
ET	1.00	1.00	8.00	8.00
EF	350	350	250	250
ED	6	30; age adj. (M)	25	25
AT	365 x 6	365 x 70	365 x 25	365 x 70
CF	-	1000	-	1000

***** Risk Associated with Vinyl Chloride via AIR *****

Using the following Calculation :

Inhalation:

$$\text{Intake (mg/Kg-day)} = (\text{CA} \times ((\text{EF} \times \text{ED} \times \text{ET})/\text{AT}))/\text{CF}$$

where :

- CA is the Chemical Concentration in the Air (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- AT is the Averaging Time (days)
- CF is the conversion factor (µg/mg)

RESIDENTIAL
CARCINOGENIC

CW User Defined
 ET 1.00
 EF 350
 ED 30
 AT 365 x 70
 CF 1000

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***** Risk Associated with Vinyl Chloride via GROUNDWATER *****

Using the following Calculation :

Inhalation:

$$\text{Intake (mg/Kg-day)} = (\text{CW} \times ((\text{EF} \times \text{ED} \times \text{ET} \times \text{VF}) / \text{AT}) + (\text{VF})) / \text{CF}$$

where :

- CW is the Chemical Concentration in the Groundwater (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- VF is the volatilization factor (L/m³)
- AT is the Averaging Time (days)
- CF is the conversion factor (µg/mg)

|-----|
 | RESIDENTIAL |
CARCINOGENIC

CW User Defined
 ET 1.00
 EF 350
 ED 30
 VF 0.5
 AT 365 x 70
 CF 1000

|-----|

***** Hazard/Risk Associated with INGESTION of FOOD PRODUCTS *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CF} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CF is the Chemical Concentration in the Food (mg/Kg)
- IR is the Ingestion Rate (kg/day)
- FI is the Fraction Ingested from the Contaminated Source
- EF is the Exposure Frequency (meals/year)

ED is the Exposure Duration (years)
 BW is the Body Weight (Kg)
 AT is the Averaging Time (days)

MEAT/EGG/DAIRY PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.280	0.280	0.280	0.280
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

FRUIT/VEGETABLE PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.122	0.122	0.122	0.122
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

FISH/SHELLFISH PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.054	0.054	0.054	0.054
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

*->

09/22/2015

15:23:00

OUTPUT FILE - C:\REAMS\OBG2.OUT

RISK EXPOSURE DEFAULT FILE USED - SYSTEM DEFAULTS

SETUP DEFAULT FILE USED - OBG RISK ASSESSMENT

FILE PARAMETER DEFAULT FILE USED - SYSTEM DEFAULTS

RISK ANALYSIS RESULTS

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*****
*****
**
** TOTAL EXPOSURE RISK :          2.4673000E-6 **
** TOTAL HAZARD INDEX  :          0.2632804982 **
**
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*****

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***** TOTAL PATHWAY RISKS *****

MEDIA	HAZARD	RISK
SOIL	0.2632804982	2.4673000E-6
GROUND WATER	0.0000000000	0.0000000E+0
SURFACE WATER	0.0000000000	0.0000000E+0
FOOD	0.0000000000	0.0000000E+0
AIR	0.0000000000	0.0000000E+0

***** HAZARD/RISK RESULTS BY CHEMICAL *****

COMMERCIAL

CHEMICAL - DIPHENYLAMINE

MEDIA	HAZARD	RISK
TOTAL	0.0000510292	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000510292	0.000000000000000E+0

CHEMICAL - 2,4-DINITROTOLUENE

MEDIA	HAZARD	RISK
TOTAL	0.0006558014	1.448000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0006558014	1.448000000000000E-7

CHEMICAL - 2,6-DINITROTOLUENE		
MEDIA	HAZARD	RISK
TOTAL	0.0005054064	2.707000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0005054064	2.707000000000000E-7

CHEMICAL - 2,4,6-TRINITROTOLUENE		
MEDIA	HAZARD	RISK
TOTAL	0.0004230275	2.300000000000000E-9
SOIL INGESTION/CONTACT/INHALATION	0.0004230275	2.300000000000000E-9

CHEMICAL - OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCINE (HMX)		
MEDIA	HAZARD	RISK
TOTAL	0.0000052829	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000052829	0.000000000000000E+0

CHEMICAL - HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)		
MEDIA	HAZARD	RISK
TOTAL	0.0016009671	1.887000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0016009671	1.887000000000000E-7

CHEMICAL - NITROGLYCERINE		
MEDIA	HAZARD	RISK
TOTAL	0.2450808561	1.488000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.2450808561	1.488000000000000E-7

CHEMICAL - MERCURY (INORGANIC)		
MEDIA	HAZARD	RISK
TOTAL	0.0131509750	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0131509750	0.000000000000000E+0

CHEMICAL - DIETHYLPHTHALATE		
MEDIA	HAZARD	RISK

TOTAL	0.0000005897	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000005897	0.0000000000000000E+0

CHEMICAL - FLUORANTHENE

MEDIA	HAZARD	RISK
TOTAL	0.0000027382	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000027382	0.0000000000000000E+0

CHEMICAL - NAPHTHALENE

MEDIA	HAZARD	RISK
TOTAL	0.0007079683	2.5900000000000000E-8
SOIL INGESTION/CONTACT/INHALATION	0.0007079683	2.5900000000000000E-8

CHEMICAL - BENZ (A) ANTHRACENE

MEDIA	HAZARD	RISK
TOTAL	0.0000000000	1.0600000000000000E-8
SOIL INGESTION/CONTACT/INHALATION	0.0000000000	1.0600000000000000E-8

CHEMICAL - BIS (2-ETHYLHEXYL) PHTHALATE

MEDIA	HAZARD	RISK
TOTAL	0.0000180679	1.8000000000000000E-9
SOIL INGESTION/CONTACT/INHALATION	0.0000180679	1.8000000000000000E-9

CHEMICAL - DIBUTYLPHTHALATE

MEDIA	HAZARD	RISK
TOTAL	0.0001406699	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0001406699	0.0000000000000000E+0

CHEMICAL - SELENIUM

MEDIA	HAZARD	RISK
TOTAL	0.0000702881	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000702881	0.0000000000000000E+0

CHEMICAL - SILVER AND COMPOUNDS		
MEDIA	HAZARD	RISK
TOTAL	0.0000325342	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000325342	0.000000000000000E+0

CHEMICAL - DIOXIN		
MEDIA	HAZARD	RISK
TOTAL	0.0008274959	4.113000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0008274959	4.113000000000000E-7

CHEMICAL - PERCHLORATE		
MEDIA	HAZARD	RISK
TOTAL	0.0000068004	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000068004	0.000000000000000E+0

CHEMICAL - 3,3'-DIMETHYLBENZIDINE		
MEDIA	HAZARD	RISK
TOTAL	0.0000000000	1.262400000000000E-6
SOIL INGESTION/CONTACT/INHALATION	0.0000000000	1.262400000000000E-6

***** HAZARD/RISK RESULTS BY MEDIA *****

SOIL INGESTION - COMMERCIAL		
CHEMICAL	HAZARD	RISK
DIPHENYLAMINE	0.0000360274	0.000000000000000E+0
2,4-DINITROTOLUENE	0.0004614726	1.022000000000000E-7
2,6-DINITROTOLUENE	0.0003578767	1.917000000000000E-7
2,4,6-TRINITROTOLUENE	0.0003732877	2.000000000000000E-9
OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCI	0.0000051541	0.000000000000000E+0
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.0015068493	1.776000000000000E-7
NITROGLYCERINE	0.1730308219	1.051000000000000E-7
DIETHYLPHTHALATE	0.0000005661	0.000000000000000E+0
FLUORANTHENE	0.0000017765	0.000000000000000E+0
NAPHTHALENE	0.0000007620	1.000000000000000E-10

BENZ (A) ANTHRACENE	0.0000000000	6.000000000000001E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000127140	1.300000000000000E-9
DIBUTYLPHTHALATE	0.0000993151	0.000000000000000E+0
SELENIUM	0.0000702055	0.000000000000000E+0
SILVER AND COMPOUNDS	0.0000325342	0.000000000000000E+0
DIOXIN	0.0004296233	1.995000000000000E-7
PERCHLORATE	0.0000068004	0.000000000000000E+0
3,3'-DIMETHYLBENZIDINE	0.0000000000	8.913000000000001E-7

SOIL CONTACT - COMMERCIAL

CHEMICAL	HAZARD	RISK
DIPHENYLAMINE	0.0000150018	0.000000000000000E+0
2,4-DINITROTOLUENE	0.0001921572	4.250000000000000E-8
2,6-DINITROTOLUENE	0.0001475297	7.900000000000002E-8
2,4,6-TRINITROTOLUENE	0.0000497398	3.000000000000000E-10
OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCI	0.0000001288	0.000000000000000E+0
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.0000941178	1.110000000000000E-8
NITROGLYCERINE	0.0720500342	4.370000000000001E-8
DIETHYLPHTHALATE	0.0000000236	0.000000000000000E+0
FLUORANTHENE	0.0000009617	0.000000000000000E+0
NAPHTHALENE	0.0000004125	1.000000000000000E-10
BENZ (A) ANTHRACENE	0.0000000000	3.300000000000000E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000052941	5.000000000000000E-10
DIBUTYLPHTHALATE	0.0000413548	0.000000000000000E+0
DIOXIN	0.0000536685	2.490000000000000E-8
3,3'-DIMETHYLBENZIDINE	0.0000000000	3.711000000000000E-7

AIR INHALATION VIA SOIL - COMMERCIAL

CHEMICAL	HAZARD	RISK
2,4-DINITROTOLUENE	0.0000021716	1.000000000000000E-10
MERCURY (INORGANIC)	0.0131509750	0.000000000000000E+0
NAPHTHALENE	0.0007067938	2.570000000000000E-8
BENZ (A) ANTHRACENE	0.0000000000	1.300000000000000E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000000598	0.000000000000000E+0
SELENIUM	0.0000000826	0.000000000000000E+0
DIOXIN	0.0003442041	1.869000000000000E-7

***** ACCEPTABLE CONCENTRATIONS *****

CONCENTRATIONS (mg/Kg) or (mg/L)	
MEDIA	INITIAL ACCEPTABLE

CHEMICAL: Arsenic

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Chromium III and compounds

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Chromium(VI)

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Diphenylamine

Soil, Non-carcinogenic	1.0520000000	20615.6475116208
Soil, Carcinogenic	1.0520000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000

Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,4-Dinitrotoluene		
Soil, Non-carcinogenic	1.0780000000	1643.7903304263
Soil, Carcinogenic	1.0780000000	7.4447513812
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,6-Dinitrotoluene		
Soil, Non-carcinogenic	0.4180000000	827.0571959516
Soil, Carcinogenic	0.4180000000	1.5441448098
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,4,6-Trinitrotoluene		
Soil, Non-carcinogenic	0.2180000000	515.3329275284
Soil, Carcinogenic	0.2180000000	94.7826086957
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000

Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Octahydro-1357-tetranitro-1357-tetrazocine (HMX)

Soil, Non-carcinogenic	0.3010000000	56976.2819663442
Soil, Carcinogenic	0.3010000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)

Soil, Non-carcinogenic	5.2800000000	3298.0065611592
Soil, Carcinogenic	5.2800000000	27.9809220986
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Nitroglycerine

Soil, Non-carcinogenic	20.2100000000	82.4625812134
Soil, Carcinogenic	20.2100000000	135.8198924731
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000

Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Mercury (inorganic)

Soil, Non-carcinogenic	0.0216000000	1.6424637717
Soil, Carcinogenic	0.0216000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Diethylphthalate

Soil, Non-carcinogenic	0.5290000000	897066.304900797
Soil, Carcinogenic	0.5290000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Dimethylphthalate

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000

Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Fluoranthene		
Soil, Non-carcinogenic	0.0830000000	30311.8837192316
Soil, Carcinogenic	0.0830000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Naphthalene		
Soil, Non-carcinogenic	0.0178000000	25.1423686626
Soil, Carcinogenic	0.0178000000	0.6872586873
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Benz(a)anthracene		
Soil, Non-carcinogenic	0.0270000000	0.0000000000
Soil, Carcinogenic	0.0270000000	2.5471698113
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Bis(2-ethylhexyl)phthalate		
Soil, Non-carcinogenic	0.2970000000	16437.9922403821
Soil, Carcinogenic	0.2970000000	165.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Dibutylphthalate		
Soil, Non-carcinogenic	11.6000000000	82462.5595098880
Soil, Carcinogenic	11.6000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Selenium		
Soil, Non-carcinogenic	0.4100000000	5833.1353386989
Soil, Carcinogenic	0.4100000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Barium and compounds		
Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000

Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Silver and compounds		
Soil, Non-carcinogenic	0.1900000000	5840.0083604330
Soil, Carcinogenic	0.1900000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Cadmium and compounds		
Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Dioxin		
Soil, Non-carcinogenic	0.0000050180	0.0060640784
Soil, Carcinogenic	0.0000050180	0.0000122003
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000

Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Perchlorate

Soil, Non-carcinogenic	0.0055600000	817.5989647668
Soil, Carcinogenic	0.0055600000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: 3,3'-Dimethylbenzidine

Soil, Non-carcinogenic	0.2650000000	0.0000000000
Soil, Carcinogenic	0.2650000000	0.2099176172
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

***** CALCULATION ALGORITHMS *****

***** Hazard/Risk Associated with INGESTION via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{IR} \times \text{CF} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- IR is the Ingestion Rate (mgsoil/day)
- CF is the Conversion Factor (10 ^ -6 Kg/mg)
- EF is the Exposure Frequency (day/years)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CS	User Defined	User Defined	User Defined	User Defined
IR	200.00	114.28; 489.50 (M)	100.00	100.00
CF	0.000001	0.000001	0.000001	0.000001
EF	350	350	250	250
ED	6	Incl. in IR Adj.	25	25
BW	15	Incl. in IR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{CF} \times \text{ABS} \times \text{EF} \times (\text{ED} \times \text{SA} \times \text{AF}) \times \text{DFSadj}}{\text{BW} \times \text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
 - CF is the Conversion Factor (10 ^ -6 Kg/mg)
 - SA is the Skin Surface Area for Contact (cm^2/event)
 - AF is the Soil to Skin Adherence Factor (unitless)
 - ABS is the Absorption Factor (unitless)
 - EF is the Exposure Frequency (day/years)
 - ED is the Exposure Duration (years)
 - DFS is the Residential soil dermal contact factor (mg-year/kg-day)
 - BW is the Body Weight (Kg)
 - AT is the Averaging Time (days)
- (RfDo modified for dermal exposure: RfDo x gastrointestinal absorption factor; CSFo modified for dermal exposure: CSFo/gastrointestinal absorption factor)

RESIDENTIAL	COMMERCIAL
-------------	------------

	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
	-----	-----	-----	-----
CS	User Defined	User Defined	User Defined	User Defined
CF	0.000001	0.000001	0.000001	0.000001
SA	2800	Incl. in DFSadj.	3470	3470
AF	0.12	0.07	0.12	0.12
ABS	User Defined	User Defined	User Defined	User Defined
EF	350	350	250	250
ED	6	Incl. in DFSadj.	25	25
DFSadj	Not Used	361; 1445 (M)	25	25
BW	15	Incl. in DFSadj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INHALATION OF PARTICULATES via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{ET} \times \text{EF} \times \text{ED} \times \left[\frac{1}{\text{VF}} + \frac{1}{\text{PEF}} \right] \times \text{CF}}{\text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the Exposure Duration (years) for non-carcinogens and carcinogens
- VF is the Volatilization factor (m³/Kg)
- PEF is the Particulate Emission Factor (m³/Kg)
- AT is the Averaging Time (days)
- CF is used only for carcinogenic calculation (µg/mg)
- ED is adjusted for mutagens as follows:
 [(IUR x 20)+(IUR x 12)+(IUR x 30)+(IUR x 14)]

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
	-----	-----	-----	-----
CS	User Defined	User Defined	User Defined	User Defined
ET	1.00	1.00	8.00	8.00
EF	350	350	250	250
ED	6	30; age-adj (M)	25	25
VF	0.5	0.5	0.5	0.5
PEF	1.36E+9	1.36E+9	1.36E+9	1.36E+9
AT	365 x 6	365 x 70	365 x 25	365 x 70
CF	-	1000	-	1000

***** Risk Associated with Vinyl Chloride via SOIL *****

Using the following Calculation :

Ingestion:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times \left(\left(\frac{\text{EF} \times \text{IF} \times \text{CF1}}{\text{AT}} \right) + \left(\frac{\text{IR} \times \text{CF}}{\text{BW}} \right) \right)$$

Inhalation:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times \left(\left(\frac{\text{EF} \times \text{ED} \times \text{ET} \times \text{CF2}}{\text{AT} \times \text{VF}} \right) + \left(\frac{\text{CF2}}{\text{VF}} \right) \right)$$

Dermal:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times \left(\left(\frac{\text{EF} \times \text{DFS} \times \text{ABS} \times \text{CF1}}{\text{AT}} \right) + \left(\frac{\text{SA} \times \text{AF} \times \text{ABS} \times \text{CF1}}{\text{BW}} \right) \right)$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- IFS is the adjusted soil ingestion rate (mg-yr/kg-d)
- IRS is the soil ingestion rate (mg/day)
- DFS is the adjusted soil dermal contact factor (mg-yr/kg-d)
- ABS is the absorption factor
- AF is the adherence factor (mg/cm²)
- BW is the body weight (kg)
- VF is the volatilization factor (m³/kg)
- AT is the Averaging Time (days)
- CF1 is the conversion factor (kg/mg)
- CF2 is the conversion factor (µg/mg)

```
      |-----|
      | RESIDENTIAL      |
      | CARCINOGENIC     |
      |-----|
CS    User Defined
ET    1.00
EF    350
ED    30
IFS   114.28
IRS   200.00
DFS   361
ABS   User Defined
AF    0.12
BW    15
VF    0.5
AT    365 x 6
CF1   0.000001
CF2   1000
      |-----|
```

***** Hazard/Risk Associated with DRINKING WELL WATER *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CW} \times \text{IR} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- IR is the Ingestion Rate (Liters/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
IR	1.00	1.09; 3.39 (M)	2.00	2.00
EF	350	350	250	250
ED	6	Incl. in IR Adj.	25	25
BW	15	Incl. in IR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Risk Associated with Vinyl Chloride via GROUNDWATER *****

Using the following Calculation :

Ingestion:

$$\text{Intake (mg/Kg-day)} = \text{CW} \times ((\text{EF} \times \text{IF})/\text{AT}) + (\text{IR}/\text{BW})$$

where :

- CW is the Chemical Concentration in the Groundwater (mg/kg)
- EF is the Exposure Frequency (day/years)
- IF is the adjusted water ingestion rate (L-yr/kg-d)
- IR is the water ingestion rate (L/day)
- BW is the body weight (kg)
- AT is the Averaging Time (days)

	RESIDENTIAL	CARCINOGENIC
CW	User Defined	
EF	350	
IF	1.086	
IR	1.00	
BW	15	
AT	365 x 70	

***** Hazard/Risk Associated with DERMAL CONTACT via WELL WATER *****

Using the following Calculation :

$$\text{Intake} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- PC is the Dermal Permeability Constant (cm/hr)
- SA is the Surface Area Exposed (cm²)
- ET is the Exposure Time (hours/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- CF is the Volumetric Conversion (1 Liter/1000 cm³)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
PC	User Defined	User Defined	User Defined	User Defined
SA	7500	9200	820	820
ET	0.2	0.2	1.0	1.0
EF	350	350	250	250
ED	6	Incl. in SA Adj.	25	25
CF	.001	.001	.001	.001
BW	15	Incl. in SA Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INCIDENTAL INGESTION via SWIMMING *****

Using the following Calculation :

$$\text{Intake (mg/Kg/day)} = \frac{\text{CW} \times \text{CR} \times \text{EF} \times \text{ET} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- CR is the Contact Rate (Liters/hour)
- EF is the Exposure Frequency (events/year)
- ET is the Exposure Time (hours/event)
- ED is the Exposure Duration (years)

BW is the Body Weight (Kg)
 AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
CR	0.05	.037	0.05	0.05
EF	7	7	7	7
ET	2.6	2.6	2.6	2.6
ED	6	Incl. in CR Adj.	25	25
BW	15	Incl. in CR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via SURFACE WATER *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- PC is the Dermal Permeability Constant (cm/hr)
- SA is the Surface Area Exposed (cm²)
- ET is the Exposure Time (hours/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- CF is the Volumetric Conversion (1 Liter/1000 cm³)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
PC	User Defined	User Defined	User Defined	User Defined
SA	7500	9200	820	820
ET	2.6	2.6	2.6	2.6
EF	7	7	7	7
ED	6	Incl. in SA Adj.	25	25
CF	.001	.001	.001	.001
BW	15	Incl. in SA Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INHALATION via AIR *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CA} \times \text{ET} \times \text{EF} \times \text{ED}}{\text{AT} \times \text{CF}}$$

where :

- CA is the Chemical Concentration in Air (mg/m³)
- ET is the Exposure Time (hours/hour)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years) for non-carcinogens and carcinogens
- AT is the Averaging Time (days)
- CF is the conversion factor (µg/mg)
- ED is adjusted for mutagens as follows:
 [(IUR x 20)+(IUR x 12)+(IUR x 30)+(IUR x 14)]

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CA	User Defined	User Defined	User Defined	User Defined
ET	1.00	1.00	8.00	8.00
EF	350	350	250	250
ED	6	30; age adj. (M)	25	25
AT	365 x 6	365 x 70	365 x 25	365 x 70
CF	-	1000	-	1000

***** Risk Associated with Vinyl Chloride via AIR *****

Using the following Calculation :

Inhalation:

$$\text{Intake (mg/Kg-day)} = (\text{CA} \times ((\text{EF} \times \text{ED} \times \text{ET})/\text{AT}))/\text{CF}$$

where :

- CA is the Chemical Concentration in the Air (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- AT is the Averaging Time (days)
- CF is the conversion factor (µg/mg)

	RESIDENTIAL	CARCINOGENIC

```

|-----|
CW  User Defined
ET  1.00
EF  350
ED  30
AT  365 x 70
CF  1000
|-----|

```

***** Risk Associated with Vinyl Chloride via GROUNDWATER *****

Using the following Calculation :

Inhalation:

$$\text{Intake (mg/Kg-day)} = (\text{CW} \times ((\text{EF} \times \text{ED} \times \text{ET} \times \text{VF})/\text{AT}) + (\text{VF})) / \text{CF}$$

where :

- CW is the Chemical Concentration in the Groundwater (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- VF is the volatilization factor (L/m³)
- AT is the Averaging Time (days)
- CF is the conversion factor (µg/mg)

```

|-----|
| RESIDENTIAL |
| CARCINOGENIC |
| ----- |
CW  User Defined
ET  1.00
EF  350
ED  30
VF  0.5
AT  365 x 70
CF  1000
|-----|

```

***** Hazard/Risk Associated with INGESTION of FOOD PRODUCTS *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CF} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CF is the Chemical Concentration in the Food (mg/Kg)
- IR is the Ingestion Rate (kg/day)
- FI is the Fraction Ingested from the Contaminated Source

EF is the Exposure Frequency (meals/year)
 ED is the Exposure Duration (years)
 BW is the Body Weight (Kg)
 AT is the Averaging Time (days)

MEAT/EGG/DAIRY PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.280	0.280	0.280	0.280
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

FRUIT/VEGETABLE PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.122	0.122	0.122	0.122
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

FISH/SHELLFISH PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.054	0.054	0.054	0.054
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

 *→

09/22/2015

15:23:48

OUTPUT FILE - C:\REAMS\OBG3.OUT

RISK EXPOSURE DEFAULT FILE USED - SYSTEM DEFAULTS

SETUP DEFAULT FILE USED - OBG RISK ASSESSMENT

FILE PARAMETER DEFAULT FILE USED - SYSTEM DEFAULTS

RISK ANALYSIS RESULTS

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*****
*****
**
** TOTAL EXPOSURE RISK :          1.2049000E-6 **
** TOTAL HAZARD INDEX  :          0.2632804982 **
**
*****
*****

```

***** TOTAL PATHWAY RISKS *****

MEDIA	HAZARD	RISK
SOIL	0.2632804982	1.2049000E-6
GROUND WATER	0.0000000000	0.0000000E+0
SURFACE WATER	0.0000000000	0.0000000E+0
FOOD	0.0000000000	0.0000000E+0
AIR	0.0000000000	0.0000000E+0

***** HAZARD/RISK RESULTS BY CHEMICAL *****

COMMERCIAL

CHEMICAL - DIPHENYLAMINE

MEDIA	HAZARD	RISK
TOTAL	0.0000510292	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000510292	0.000000000000000E+0

CHEMICAL - 2,4-DINITROTOLUENE

MEDIA	HAZARD	RISK
TOTAL	0.0006558014	1.448000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0006558014	1.448000000000000E-7

CHEMICAL - 2,6-DINITROTOLUENE		
MEDIA	HAZARD	RISK
TOTAL	0.0005054064	2.707000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0005054064	2.707000000000000E-7

CHEMICAL - 2,4,6-TRINITROTOLUENE		
MEDIA	HAZARD	RISK
TOTAL	0.0004230275	2.300000000000000E-9
SOIL INGESTION/CONTACT/INHALATION	0.0004230275	2.300000000000000E-9

CHEMICAL - OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCINE (HMX)		
MEDIA	HAZARD	RISK
TOTAL	0.0000052829	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000052829	0.000000000000000E+0

CHEMICAL - HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)		
MEDIA	HAZARD	RISK
TOTAL	0.0016009671	1.887000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0016009671	1.887000000000000E-7

CHEMICAL - NITROGLYCERINE		
MEDIA	HAZARD	RISK
TOTAL	0.2450808561	1.488000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.2450808561	1.488000000000000E-7

CHEMICAL - MERCURY (INORGANIC)		
MEDIA	HAZARD	RISK
TOTAL	0.0131509750	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0131509750	0.000000000000000E+0

CHEMICAL - DIETHYLPHTHALATE		
MEDIA	HAZARD	RISK

TOTAL	0.0000005897	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000005897	0.0000000000000000E+0

CHEMICAL - FLUORANTHENE

MEDIA	HAZARD	RISK
TOTAL	0.0000027382	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000027382	0.0000000000000000E+0

CHEMICAL - NAPHTHALENE

MEDIA	HAZARD	RISK
TOTAL	0.0007079683	2.5900000000000000E-8
SOIL INGESTION/CONTACT/INHALATION	0.0007079683	2.5900000000000000E-8

CHEMICAL - BENZ (A) ANTHRACENE

MEDIA	HAZARD	RISK
TOTAL	0.0000000000	1.0600000000000000E-8
SOIL INGESTION/CONTACT/INHALATION	0.0000000000	1.0600000000000000E-8

CHEMICAL - BIS (2-ETHYLHEXYL) PHTHALATE

MEDIA	HAZARD	RISK
TOTAL	0.0000180679	1.8000000000000000E-9
SOIL INGESTION/CONTACT/INHALATION	0.0000180679	1.8000000000000000E-9

CHEMICAL - DIBUTYLPHTHALATE

MEDIA	HAZARD	RISK
TOTAL	0.0001406699	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0001406699	0.0000000000000000E+0

CHEMICAL - SELENIUM

MEDIA	HAZARD	RISK
TOTAL	0.0000702881	0.0000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000702881	0.0000000000000000E+0

CHEMICAL - SILVER AND COMPOUNDS		
MEDIA	HAZARD	RISK
TOTAL	0.0000325342	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000325342	0.000000000000000E+0

CHEMICAL - DIOXIN		
MEDIA	HAZARD	RISK
TOTAL	0.0008274959	4.113000000000000E-7
SOIL INGESTION/CONTACT/INHALATION	0.0008274959	4.113000000000000E-7

CHEMICAL - PERCHLORATE		
MEDIA	HAZARD	RISK
TOTAL	0.0000068004	0.000000000000000E+0
SOIL INGESTION/CONTACT/INHALATION	0.0000068004	0.000000000000000E+0

***** HAZARD/RISK RESULTS BY MEDIA *****

SOIL INGESTION - COMMERCIAL		
CHEMICAL	HAZARD	RISK
DIPHENYLAMINE	0.0000360274	0.000000000000000E+0
2,4-DINITROTOLUENE	0.0004614726	1.022000000000000E-7
2,6-DINITROTOLUENE	0.0003578767	1.917000000000000E-7
2,4,6-TRINITROTOLUENE	0.0003732877	2.000000000000000E-9
OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCl	0.0000051541	0.000000000000000E+0
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.0015068493	1.776000000000000E-7
NITROGLYCERINE	0.1730308219	1.051000000000000E-7
DIETHYLPHTHALATE	0.0000005661	0.000000000000000E+0
FLUORANTHENE	0.0000017765	0.000000000000000E+0
NAPHTHALENE	0.0000007620	1.000000000000000E-10
BENZ (A) ANTHRACENE	0.0000000000	6.000000000000001E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000127140	1.300000000000000E-9
DIBUTYLPHTHALATE	0.0000993151	0.000000000000000E+0
SELENIUM	0.0000702055	0.000000000000000E+0
SILVER AND COMPOUNDS	0.0000325342	0.000000000000000E+0
DIOXIN	0.0004296233	1.995000000000000E-7
PERCHLORATE	0.0000068004	0.000000000000000E+0

SOIL CONTACT - COMMERCIAL

CHEMICAL	HAZARD	RISK
DIPHENYLAMINE	0.0000150018	0.000000000000000E+0
2,4-DINITROTOLUENE	0.0001921572	4.250000000000000E-8
2,6-DINITROTOLUENE	0.0001475297	7.900000000000002E-8
2,4,6-TRINITROTOLUENE	0.0000497398	3.000000000000000E-10
OCTAHYDRO-1357-TETRANITRO-1357-TETRAZOCI	0.0000001288	0.000000000000000E+0
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.0000941178	1.110000000000000E-8
NITROGLYCERINE	0.0720500342	4.370000000000001E-8
DIETHYLPHTHALATE	0.0000000236	0.000000000000000E+0
FLUORANTHENE	0.0000009617	0.000000000000000E+0
NAPHTHALENE	0.0000004125	1.000000000000000E-10
BENZ (A) ANTHRACENE	0.0000000000	3.300000000000000E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000052941	5.000000000000000E-10
DIBUTYLPHTHALATE	0.0000413548	0.000000000000000E+0
DIOXIN	0.0000536685	2.490000000000000E-8

AIR INHALATION VIA SOIL - COMMERCIAL

CHEMICAL	HAZARD	RISK
2,4-DINITROTOLUENE	0.0000021716	1.000000000000000E-10
MERCURY (INORGANIC)	0.0131509750	0.000000000000000E+0
NAPHTHALENE	0.0007067938	2.570000000000000E-8
BENZ (A) ANTHRACENE	0.0000000000	1.300000000000000E-9
BIS (2-ETHYLHEXYL) PHTHALATE	0.0000000598	0.000000000000000E+0
SELENIUM	0.0000000826	0.000000000000000E+0
DIOXIN	0.0003442041	1.869000000000000E-7

***** ACCEPTABLE CONCENTRATIONS *****

MEDIA	CONCENTRATIONS (mg/Kg) or (mg/L)	
	INITIAL	ACCEPTABLE

CHEMICAL: Arsenic

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000

Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Chromium III and compounds

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Chromium(VI)

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Diphenylamine

Soil, Non-carcinogenic	1.0520000000	20615.6475116208
Soil, Carcinogenic	1.0520000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000

Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,4-Dinitrotoluene		
Soil, Non-carcinogenic	1.0780000000	1643.7903304263
Soil, Carcinogenic	1.0780000000	7.4447513812
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,6-Dinitrotoluene		
Soil, Non-carcinogenic	0.4180000000	827.0571959516
Soil, Carcinogenic	0.4180000000	1.5441448098
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: 2,4,6-Trinitrotoluene		
Soil, Non-carcinogenic	0.2180000000	515.3329275284
Soil, Carcinogenic	0.2180000000	94.7826086957
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Octahydro-1357-tetranitro-1357-tetrazocine (HMX)

Soil, Non-carcinogenic	0.3010000000	56976.2819663442
Soil, Carcinogenic	0.3010000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)

Soil, Non-carcinogenic	5.2800000000	3298.0065611592
Soil, Carcinogenic	5.2800000000	27.9809220986
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Nitroglycerine

Soil, Non-carcinogenic	20.2100000000	82.4625812134
Soil, Carcinogenic	20.2100000000	135.8198924731
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Mercury (inorganic)

Soil, Non-carcinogenic	0.0216000000	1.6424637717
Soil, Carcinogenic	0.0216000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000

Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Diethylphthalate

Soil, Non-carcinogenic	0.5290000000	897066.304900797
Soil, Carcinogenic	0.5290000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Dimethylphthalate

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Fluoranthene

Soil, Non-carcinogenic	0.0830000000	30311.8837192316
Soil, Carcinogenic	0.0830000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000

Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Naphthalene		
Soil, Non-carcinogenic	0.0178000000	25.1423686626
Soil, Carcinogenic	0.0178000000	0.6872586873
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Benz(a)anthracene		
Soil, Non-carcinogenic	0.0270000000	0.0000000000
Soil, Carcinogenic	0.0270000000	2.5471698113
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Bis(2-ethylhexyl)phthalate		
Soil, Non-carcinogenic	0.2970000000	16437.9922403821
Soil, Carcinogenic	0.2970000000	165.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000

Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Dibutylphthalate

Soil, Non-carcinogenic	11.6000000000	82462.5595098880
Soil, Carcinogenic	11.6000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Selenium

Soil, Non-carcinogenic	0.4100000000	5833.1353386989
Soil, Carcinogenic	0.4100000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Barium and compounds

Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000

Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Silver and compounds		
Soil, Non-carcinogenic	0.1900000000	5840.0083604330
Soil, Carcinogenic	0.1900000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Cadmium and compounds		
Soil, Non-carcinogenic	0.0000000000	0.0000000000
Soil, Carcinogenic	0.0000000000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000
CHEMICAL: Dioxin		
Soil, Non-carcinogenic	0.0000050180	0.0060640784
Soil, Carcinogenic	0.0000050180	0.0000122003
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: Perchlorate		
Soil, Non-carcinogenic	0.0055600000	817.5989647668
Soil, Carcinogenic	0.0055600000	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

CHEMICAL: 3,3'-Dimethylbenzidine		
Soil, Non-carcinogenic	0.0000000100	0.0000000000
Soil, Carcinogenic	0.0000000100	0.0000000000
Groundwater, Non-carcinogenic	0.0000000000	0.0000000000
Groundwater, Carcinogenic	0.0000000000	0.0000000000
Surface Water, Non-carcinogenic	0.0000000000	0.0000000000
Surface Water, Carcinogenic	0.0000000000	0.0000000000
Air, Non-carcinogenic	0.0000000000	0.0000000000
Air, Carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Non-carcinogenic	0.0000000000	0.0000000000
Meat/Eggs/Dairy, Carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Non-carcinogenic	0.0000000000	0.0000000000
Fruit/Vegetables, Carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Non-carcinogenic	0.0000000000	0.0000000000
Fish/Shellfish, Carcinogenic	0.0000000000	0.0000000000

***** CALCULATION ALGORITHMS *****

***** Hazard/Risk Associated with INGESTION via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{IR} \times \text{CF} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- IR is the Ingestion Rate (mgsoil/day)
- CF is the Conversion Factor (10 ^ -6 Kg/mg)
- EF is the Exposure Frequency (day/years)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)

AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CS	User Defined	User Defined	User Defined	User Defined
IR	200.00	114.28; 489.50 (M)	100.00	100.00
CF	0.000001	0.000001	0.000001	0.000001
EF	350	350	250	250
ED	6	Incl. in IR Adj.	25	25
BW	15	Incl. in IR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{CF} \times \text{ABS} \times \text{EF} \times (\text{ED} \times \text{SA} \times \text{AF}) \times \text{DFSadj}}{\text{BW} \times \text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
 - CF is the Conversion Factor (10⁻⁶ Kg/mg)
 - SA is the Skin Surface Area for Contact (cm²/event)
 - AF is the Soil to Skin Adherence Factor (unitless)
 - ABS is the Absorption Factor (unitless)
 - EF is the Exposure Frequency (day/years)
 - ED is the Exposure Duration (years)
 - DFS is the Residential soil dermal contact factor (mg-year/kg-day)
 - BW is the Body Weight (Kg)
 - AT is the Averaging Time (days)
- (RfDo modified for dermal exposure: RfDo x gastrointestinal absorption factor; CSFo modified for dermal exposure: CSFo/gastrointestinal absorption factor)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CS	User Defined	User Defined	User Defined	User Defined
CF	0.000001	0.000001	0.000001	0.000001
SA	2800	Incl. in DFSadj.	3470	3470
AF	0.12	0.07	0.12	0.12
ABS	User Defined	User Defined	User Defined	User Defined
EF	350	350	250	250
ED	6	Incl. in DFSadj.	25	25
DFSadj	Not Used	361; 1445 (M)	25	25

BW	15	Incl. in DFSadj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

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***** Hazard/Risk Associated with INHALATION OF PARTICULATES via SOIL *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CS} \times \text{ET} \times \text{EF} \times \text{ED} \times [(1/\text{VF}) + (1/\text{PEF})] \times \text{CF}}{\text{AT}}$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the Exposure Duration (years) for non-carcinogens and carcinogens
- VF is the Volatilization factor (m³/Kg)
- PEF is the Particulate Emission Factor (m³/Kg)
- AT is the Averaging Time (days)
- CF is used only for carcinogenic calculation (µg/mg)
- ED is adjusted for mutagens as follows:
 [(IUR x 20)+(IUR x 12)+(IUR x 30)+(IUR x 14)]

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
	-----	-----	-----	-----
CS	User Defined	User Defined	User Defined	User Defined
ET	1.00	1.00	8.00	8.00
EF	350	350	250	250
ED	6	30; age-adj (M)	25	25
VF	0.5	0.5	0.5	0.5
PEF	1.36E+9	1.36E+9	1.36E+9	1.36E+9
AT	365 x 6	365 x 70	365 x 25	365 x 70
CF	-	1000	-	1000

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***** Risk Associated with Vinyl Chloride via SOIL *****

Using the following Calculation :

Ingestion:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times ((\text{EF} \times \text{IF} \times \text{CF1})/\text{AT}) + ((\text{IR} \times \text{CF})/\text{BW}))$$

Inhalation:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times ((\text{EF} \times \text{ED} \times \text{ET} \times \text{CF2})/\text{AT} \times \text{VF}) + ((\text{CF2})/\text{VF}))$$

Dermal:

$$\text{Intake (mg/Kg-day)} = \text{CS} \times ((\text{EF} \times \text{DFS} \times \text{ABS} \times \text{CF1})/\text{AT}) + ((\text{SA} \times \text{AF} \times \text{ABS} \times \text{CF1})/\text{BW}))$$

where :

- CS is the Chemical Concentration in the Soil (mg/kg)
- ET is the Exposure Time (hr/hr)
- EF is the Exposure Frequency (day/years)
- ED is the exposure duration (years)
- IFS is the adjusted soil ingestion rate (mg-yr/kg-d)
- IRS is the soil ingestion rate (mg/day)
- DFS is the adjusted soil dermal contact factor (mg-yr/kg-d)
- ABS is the absorption factor
- AF is the adherence factor (mg/cm2)
- BW is the body weight (kg)
- VF is the volatilization factor (m³/kg)
- AT is the Averaging Time (days)
- CF1 is the conversion factor (kg/mg)
- CF2 is the conversion factor (µg/mg)

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|-----|
| RESIDENTIAL |
| CARCINOGENIC |
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- CS User Defined
- ET 1.00
- EF 350
- ED 30
- IFS 114.28
- IRS 200.00
- DFS 361
- ABS User Defined
- AF 0.12
- BW 15
- VF 0.5
- AT 365 x 6
- CF1 0.000001
- CF2 1000

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***** Hazard/Risk Associated with DRINKING WELL WATER *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CW} \times \text{IR} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- IR is the Ingestion Rate (Liters/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)

BW is the Body Weight (Kg)
 AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
IR	1.00	1.09; 3.39(M)	2.00	2.00
EF	350	350	250	250
ED	6	Incl. in IR Adj.	25	25
BW	15	Incl. in IR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Risk Associated with Vinyl Chloride via GROUNDWATER *****
 Using the following Calculation :

Ingestion:

$$\text{Intake (mg/Kg-day)} = \text{CW} \times ((\text{EF} \times \text{IF})/\text{AT}) + (\text{IR}/\text{BW})$$

where :

- CW is the Chemical Concentration in the Groundwater (mg/kg)
- EF is the Exposure Frequency (day/years)
- IF is the adjusted water ingestion rate (L-yr/kg-d)
- IR is the water ingestion rate (L/day)
- BW is the body weight (kg)
- AT is the Averaging Time (days)

	RESIDENTIAL CARCINOGENIC
CW	User Defined
EF	350
IF	1.086
IR	1.00
BW	15
AT	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via WELL WATER *****

Using the following Calculation :

$$\text{Intake} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- PC is the Dermal Permeability Constant (cm/hr)
- SA is the Surface Area Exposed (cm²)
- ET is the Exposure Time (hours/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- CF is the Volumetric Conversion (1 Liter/1000 cm³)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
PC	User Defined	User Defined	User Defined	User Defined
SA	7500	9200	820	820
ET	0.2	0.2	1.0	1.0
EF	350	350	250	250
ED	6	Incl. in SA Adj.	25	25
CF	.001	.001	.001	.001
BW	15	Incl. in SA Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INCIDENTAL INGESTION via SWIMMING *****

Using the following Calculation :

$$\text{Intake (mg/Kg/day)} = \frac{\text{CW} \times \text{CR} \times \text{EF} \times \text{ET} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- CR is the Contact Rate (Liters/hour)
- EF is the Exposure Frequency (events/year)
- ET is the Exposure Time (hours/event)
- ED is the Exposure Duration (years)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
CR	0.05	.037	0.05	0.05

EF	7	7	7	7
ET	2.6	2.6	2.6	2.6
ED	6	Incl. in CR Adj.	25	25
BW	15	Incl. in CR Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with DERMAL CONTACT via SURFACE WATER *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CW} \times \text{SA} \times \text{PC} \times \text{ET} \times \text{EF} \times \text{ED} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where :

- CW is the Chemical Concentration in Water (mg/L)
- PC is the Dermal Permeability Constant (cm/hr)
- SA is the Surface Area Exposed (cm²)
- ET is the Exposure Time (hours/day)
- EF is the Exposure Frequency (days/year)
- ED is the Exposure Duration (years)
- CF is the Volumetric Conversion (1 Liter/1000 cm³)
- BW is the Body Weight (Kg)
- AT is the Averaging Time (days)

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CW	User Defined	User Defined	User Defined	User Defined
PC	User Defined	User Defined	User Defined	User Defined
SA	7500	9200	820	820
ET	2.6	2.6	2.6	2.6
EF	7	7	7	7
ED	6	Incl. in SA Adj.	25	25
CF	.001	.001	.001	.001
BW	15	Incl. in SA Adj.	80	80
AT	365 x 6	365 x 70	365 x 25	365 x 70

***** Hazard/Risk Associated with INHALATION via AIR *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CA} \times \text{ET} \times \text{EF} \times \text{ED}}{\text{AT} \times \text{CF}}$$

where :

CA is the Chemical Concentration in Air (mg/m³)
 ET is the Exposure Time (hours/hour)
 EF is the Exposure Frequency (days/year)
 ED is the Exposure Duration (years) for non-carcinogens and carcinogens
 AT is the Averaging Time (days)
 CF is the conversion factor (µg/mg)
 ED is adjusted for mutagens as follows:
 [(IUR x 20)+(IUR x 12)+(IUR x 30)+(IUR x 14)]

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CA	User Defined	User Defined	User Defined	User Defined
ET	1.00	1.00	8.00	8.00
EF	350	350	250	250
ED	6	30; age adj. (M)	25	25
AT	365 x 6	365 x 70	365 x 25	365 x 70
CF	-	1000	-	1000

***** Risk Associated with Vinyl Chloride via AIR *****

Using the following Calculation :

Inhalation:

$$\text{Intake (mg/Kg-day)} = (\text{CA} \times ((\text{EF} \times \text{ED} \times \text{ET})/\text{AT}))/\text{CF}$$

where :

CA is the Chemical Concentration in the Air (mg/kg)
 ET is the Exposure Time (hr/hr)
 EF is the Exposure Frequency (day/years)
 ED is the exposure duration (years)
 AT is the Averaging Time (days)
 CF is the conversion factor (µg/mg)

	RESIDENTIAL
	CARCINOGENIC
CW	User Defined
ET	1.00
EF	350
ED	30
AT	365 x 70
CF	1000

***** Risk Associated with Vinyl Chloride via GROUNDWATER *****

Using the following Calculation :

Inhalation:

$$\text{Intake (mg/Kg-day)} = (\text{CW} \times (((\text{EF} \times \text{ED} \times \text{ET} \times \text{VF}) / \text{AT}) + (\text{VF}))) / \text{CF}$$

where :

CW is the Chemical Concentration in the Groundwater (mg/kg)

ET is the Exposure Time (hr/hr)

EF is the Exposure Frequency (day/years)

ED is the exposure duration (years)

VF is the volatilization factor (L/m³)

AT is the Averaging Time (days)

CF is the conversion factor (µg/mg)

	RESIDENTIAL
	CARCINOGENIC

CW	User Defined
ET	1.00
EF	350
ED	30
VF	0.5
AT	365 x 70
CF	1000

***** Hazard/Risk Associated with INGESTION of FOOD PRODUCTS *****

Using the following Calculation :

$$\text{Intake (mg/Kg-day)} = \frac{\text{CF} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where :

CF is the Chemical Concentration in the Food (mg/Kg)

IR is the Ingestion Rate (kg/day)

FI is the Fraction Ingested from the Contaminated Source

EF is the Exposure Frequency (meals/year)

ED is the Exposure Duration (years)

BW is the Body Weight (Kg)

AT is the Averaging Time (days)

MEAT/EGG/DAIRY PRODUCTS :

	RESIDENTIAL		COMMERCIAL
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC
			CARCINOGENIC

CF	User Defined	User Defined	User Defined	User Defined
IR	0.280	0.280	0.280	0.280
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

FRUIT/VEGETABLE PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.122	0.122	0.122	0.122
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

FISH/SHELLFISH PRODUCTS :

	RESIDENTIAL		COMMERCIAL	
	NON-CARCINOGENIC	CARCINOGENIC	NON-CARCINOGENIC	CARCINOGENIC
CF	User Defined	User Defined	User Defined	User Defined
IR	0.054	0.054	0.054	0.054
FI	1	1	1	1
EF	350	350	350	350
ED	30	Incl. in IR Adj.	25	25
BW	80	Incl. in IR Adj.	80	80
AT	365 x 30	365 x 70	365 x 25	365 x 70

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