APPENDIX B

BASELINE HUMAN HEALTH RISK ASSESSMENT

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7TH STREET AND ARIZONA AVENUE WQARF SITE
TUCSON, ARIZONA

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Prepared for:

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ACRONYMS

AAC	Arizona Administrative Code
ADAF	Age-Dependent Adjustment Factor
ADEQ	Arizona Department of Environmental Quality
ARAR	Applicable or Relevant and Appropriate Requirement
AWQS	Aquifer Water Quality Standards
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
COPC	Chemical of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DCE	Dichloroethene
DNAPL	Dense Nonaqueous Phase Liquid
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DQOs	Data Quality Objectives
DUER	Declaration of Environmental Use Restriction
ENSO	El Niño-Southern Oscillation
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Early Response Action
FS	Feasibility Study
FSP	Field Sampling Plan
HASP	Health and Safety Plan
HGC	Hydro Geo Chem, Inc.
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IDW	Investigation Derived Waste
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
LNAPL	Light Nonaqueous Phase Liquid
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NAD	North American Datum
NAPL	Nonaqueous Phase Liquid
NAVD	North American Vertical Datum

ACRONYMS (Continued)

ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PCE	Tetrachloroethene
PEL	Permissible Exposure Limit
PPRTV	Provisional Peer Reviewed Toxicity Values
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RfC	Inhalation Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RO	Remedial Objective
RPD	Relative Percent Difference
RSL	Regional Screening Level
SC	Specific Conductivity
SRL	Soil Remediation Levels
TCE	Trichloroethene
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
UPRR	Union Pacific Railroad
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WP	Work Plan
WQARF	Water Quality Assurance Revolving Fund

1. INTRODUCTION

This report presents the human health risk assessment (HHRA) conducted for the Arizona Department of Environmental Quality (ADEQ) at the 7th Street and Arizona Avenue Water Quality Assurance Revolving Fund (WQARF) site in Tucson, Arizona (Figure B.1). Potential human exposures and health risks associated with current environmental conditions and land use at and within the vicinity of the Site are evaluated consistent with A.A.C. R18-16-406(E). Due to the presence of chemicals of concern being at depth and the urban character of the site, evaluation of ecological receptors is not warranted.

1.1 Background

Soil and groundwater have been impacted by volatile organic compounds (VOCs) associated with the former Oliver's Cleaners facility, located at 300 East 7th Street (Figure B.1). Concentrations of tetrachloroethene (PCE) up to 17 milligrams per kilogram (mg/kg) were detected in soil samples from beneath the facility during the Early Response Action (ERA) site investigation (Kleinfelder and HGC, 2003). PCE and its transformation products, trichloroethene (TCE), *cis*-1,2-dichloroethene (*cis*DCE), and *trans*-1,2-dichloroethene (*trans*DCE), have been detected in groundwater samples from beneath and northwest of the facility at cumulative concentrations up to 3,200 micrograms per liter (µg/L).

The salient features of the site and degree and extent of contamination are detailed in the Remedial Investigation (RI) report. Local hydrogeology consists of a "perched" groundwater zone separated from the regional aquifer by a relatively impermeable clay layer (aquitard) approximately 15 feet thick that underlies the area at an approximate depth of 85 feet below ground surface (bgs). Laboratory analyses of groundwater samples from wells in the regional aquifer indicate that they have no detectable amounts of VOC contaminants associated with the release.

The WQARF site boundaries are based on the extent of a plume of PCE-impacted groundwater in the perched groundwater (Figure B.1). The plume begins at the former Oliver's Cleaner's facility, (currently a 42,000-square-foot paved parking lot) and extends at least 3,000 feet to the northwest. The PCE-impacted plume begins on the northern fringe of a large area of petroleum hydrocarbon light non-aqueous phase liquid (LNAPL) floating on the perched groundwater that is thought to be associated with the Union Pacific Railroad (UPRR) passenger depot, located approximately 1,000 feet to the south. Two leaking underground storage tank sites, the Yellow Cab and the former Bridgestone-Firestone facilities, are located northwest of the Oliver's Cleaners facility within the PCE plume.

The perched groundwater is currently not being used as a water supply for consumptive use. There are currently no drinking water wells within the perched groundwater in the vicinity of the Site and no new drinking water wells can be drilled into the perched groundwater pursuant to ARS § 45-454(C) that states drilling of a private well on land within 100 feet of the operating water distribution system of a municipal water provider within the boundaries of an Active Management Area (AMA) is prohibited.

A soil vapor extraction system was operated on the source property from June 13, 2006 to June 23, 2009. Additionally, an air sparging pilot test was performed in November 2007.

1.2 Objectives

The objective of the baseline risk assessment is to evaluate and quantify potential human health risks associated with the Site that will support decision-making regarding appropriate remedial actions. Based on the lack of current or reasonably anticipated future use of the perched groundwater as a water supply, the risk assessment does not consider exposures due to direct ingestion, inhalation or dermal contact with contaminated groundwater. Additionally, due to the apparent lack of ecological receptors, ecological risk will not be considered.

The risk assessment identifies relevant human receptors and exposure scenarios, evaluates potential exposures and characterizes human health risks associated with Site-related chemicals under current conditions; future land use is not considered. Both cancer risks and non-cancer health hazards are considered. Uncertainties associated with the elements of the risk assessment are discussed to provide context for the risk characterization.

In keeping with accepted practice, the risk assessment is intended to provide a reasonable representation of human health risk without understating potential health impacts.

In the context of this risk assessment, use of the term “conservative” connotes that the associated parameter value or assumption tends to lead to an increase in the estimated exposure concentrations or overstatement of risk.

2. SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Based on sampling data from the Site, 58 chemicals are reported in soil, soil vapor and groundwater. The physicochemical properties of these chemicals are summarized in Table B.1. Of these, PCE, TCE, *cis*DCE, *trans*DCE, chloroform and the trimethylbenzenes are the most pervasive and widely reported chemicals at the Site. The majority of the petroleum hydrocarbon and related compounds reported in soil vapor and groundwater at the Site appear to be related to the LNAPL thought to be sourced from the adjacent UPRR passenger depot site and are not strictly site-related. However, releases of petroleum-based solvents that were used at the former Oliver's Cleaners establishment (Kleinfelder and HGC, 2003) likely contributed petroleum hydrocarbons that contribute to overall risk at the Site.

Chemicals of potential concern (COPCs) are those that are potentially site-related and for which data are of sufficient quality for use in a human health risk assessment (Environmental Protection Agency (EPA), 1989). The selection of COPCs for inclusion in the risk assessment involves consideration of the spatial and temporal occurrence of chemicals in environmental media and their reported concentrations relative to conservative risk-based screening concentrations for the relevant media. This includes evaluation of the frequency with which a chemical is found in samples and the range of reporting limits for analytical results. The salient statistics and concentrations for chemicals reported from the Site, their risk-based screening levels and rationale for retention or exclusion as COPCs are summarized in Tables B.2, B.3 and B.4, for soil, soil vapor and perched groundwater, respectively.

Several of the chemicals reported to be present in soil, soil vapor and groundwater at the Site occur infrequently or in isolated locations and would not be expected to contribute materially to health risk. Therefore, the frequency of detection is evaluated to determine those chemicals that are retained as COPCs for the risk assessment. A relatively conservative threshold based on equaling or exceeding five percent (5%) of the reporting frequency is used.

In general, chemicals are retained as COPCs if the maximum or minimum reported concentrations exceed risk-based screening concentrations. Compounds reported at concentrations below relevant risk-based concentrations are excluded as COPCs. Media concentrations are compared to screening levels based on the EPA Regional Screening Levels (RSLs) (EPA, 2012a). The screening level for each chemical is determined from the RSLs based on the lowest concentration in the RSL table for carcinogenic or non-cancer risk. Additionally, the RSLs for non-cancer risk are based on the assumption that exposure is only to an individual chemical and these values are divided by 10 to account for the presence of multiple chemicals

(EPA, 2012b). In the case of PCE and TCE, this resulted in a more conservative non-cancer screening level.

2.1 Soil

Soil concentrations are compared to screening levels based on the RSLs for an industrial worker exposed to soil and Arizona non-residential Soil Remediation Levels (SRLs) (Table B.2). These guidelines and standards are appropriate given the current land use and potential exposure to soil. The most likely receptor under current conditions would be a utility worker and the industrial RSLs and non-residential SRLs are conservative with respect to expected utility worker exposure. None of the chemicals reported in soil exceed their respective RSLs or non-residential SRLs.

2.2 Soil Vapor

In this evaluation, the laboratory reporting limits for soil vapor results are also considered since these are quite variable across samples and sampling events due to sample dilutions used at the laboratory. In some cases, elevated reporting limits in later rounds of samples preclude exclusion of some chemicals as COPCs (e.g., vinyl chloride).

Soil vapor concentrations are compared to screening levels based on the RSLs for residential ambient air (Table B.3). This provides a conservative screen that effectively assumes inhalation of soil vapor concentrations. Chemicals retained as COPCs for soil vapor are highlighted in Table B.3.

2.3 Groundwater

Since the perched groundwater is not considered a drinking water source, the potential exposure pathways of interest for this risk assessment involve volatilization with subsequent inhalation. Therefore, use of tap water RSLs to screen groundwater contaminants as COPCs would not be relevant. Instead, a screening analysis is performed to evaluate potential volatilization from groundwater by determining equilibrium vapor concentrations of chemicals associated with the reported concentrations in groundwater and comparing them to RSLs for residential ambient air as described above. For chemicals in dilute aqueous solutions, the equilibrium ratio of the dissolved concentration (C_w) to the vapor concentration (C_v) is estimated by:

$$C_v = C_w \times \frac{H}{RT} \times 1000\, {}^{L}\!/_{m^3}$$

Where:

C_v	is vapor concentration in units of µg/m^3,
C_w	is groundwater concentration in units of µg/L,
H	is Henry's law constant (atm-m^3/mol),
R	is the Universal Gas Constant (8.206×10^{-5} atm-m^3/mol-°K), and
T	is temperature (°K = °C + 273.15).

The resulting vapor concentrations at 25°C for the chemicals found in groundwater are summarized and compared to the residential ambient air RSLs in Table B.4. Chemicals retained as COPCs for groundwater are highlighted in Table B.4

2.4 Other Considerations

While many of the hydrocarbon compounds in groundwater qualify as COPCs in terms of frequency of occurrence and concentration relative to screening levels, they are not considered COPCs for this risk assessment by virtue of their presence below the LNAPL body, precluding volatilization from groundwater to soil vapor. Similarly, many of the hydrocarbons in soil vapor are associated with the LNAPL body and occur at locations away from the source property where they are not considered Site-related and are not addressed as COPCs for this risk assessment.

Several chemicals found in soil vapor and groundwater lack ambient air RSLs due to lack of inhalational toxicology values, including the butylbenzene isomers, 1,3-dichlorobenzene, *cis*-1,2-dichloroethene, 1,3-dichloropropane, ethyl acetate, 4-ethyltoluene, heptane, *p*-isopropyltoluene, methylcyclohexane, octane, 1,3,5-trimethylbenzene and 2,2,4-trimethylpentane. These compounds are retained as COPCs for the respective media, carried forward in the risk assessment and addressed in the Uncertainty Analysis.

3. EXPOSURE ASSESSMENT

The exposure assessment is a qualitative determination or quantitative estimation of the magnitude, frequency, duration, and route of exposure for COPCs in environmental media. It includes both actual and potential receptors of chemical exposures at a site and identifies and examines possible pathways of exposure for the various contaminated media. The objective of the exposure assessment is to provide an estimate of exposure point concentrations (EPCs) in environmental media, exposure concentrations and intakes that are used to characterize the risk associated with the COPCs.

The potential for exposure is evaluated under current use conditions. The current land use of the area determines the nature of the human receptors that are or may be present, thus establishing the relevant exposure pathways to be considered.

EPA identifies three components of an exposure assessment: (1) characterizing the exposure setting, (2) identifying exposure pathways, and (3) quantifying exposures.

3.1 Exposure Setting

Characterization of the exposure setting is based on an evaluation of the degree and extent of COPCs in environmental media that define the source of exposure and the current land use in the vicinity of the Site that define the potential receptors. Current land uses in the vicinity of the Site are determined based on the Land Use Study presented in Appendix A of the RI Report. In the context of this risk assessment, use of the term "off-site" should be taken to mean off of the source property.

3.1.1 Sources and Impacted Media

Apparent releases from underground storage tank systems and solvent handling at the former Oliver's Cleaners introduced contaminants from various dry cleaning solvents into the subsurface. These included constituents from petroleum-based solvent and PCE. Solvents moved downward through the vadose zone as non-aqueous phase liquids (NAPLs). The released solvents have produced soil contamination near the surface and entrapped NAPL has volatilized to produce a soil vapor contamination plume below the source property.

A light non-aqueous phase liquid (LNAPL) body consisting of diesel-like petroleum hydrocarbons extends below the source property and is thought to be sourced from the adjacent Union Pacific passenger depot site (Figure B.2). Chlorinated solvent compounds have mixed with the LNAPL as evidenced by the presence of PCE, TCE and DCE in LNAPL samples collected from the Site. This admixture acts as an ongoing source of petroleum-related and chlorinated hydrocarbons to perched groundwater and soil vapor. The LNAPL appears to be substantially depleted in soluble petroleum hydrocarbons as indicated by the relatively low concentrations of these constituents in perched groundwater and the fact that currently the petroleum hydrocarbon solute plume essentially mimics the extent of LNAPL (Figure B.2).

A groundwater solute plume consisting primarily of chlorinated ethenes extends downgradient from the source area to the northwest for a distance of approximately 3,000 feet (Figure B.2).

Soil vapor contamination is present throughout the vadose zone in the source area and at depth extends to the northwest roughly along the axis of the groundwater solute plume. Additionally, soil vapor contamination is present at depth to the southeast of the source property where a PCE concentration of 51,700 $\mu g/m^3$ was reported from MW-PD-6.

The source property is substantially underlain by LNAPL, precluding volatilization from perched groundwater. Additionally, the soil vapor sample results that are available for this area are better representative of potential vaporization of COPCs from LNAPL than are theoretical estimates based on partitioning. Vapor concentration gradients generally are upward in this area, indicating that the LNAPL is the predominant source for soil vapor contamination.

The operation of the SVE system and the air sparging pilot test at the source property reduced soil vapor concentrations of contaminants, in some cases significantly. Therefore, more weight is given to more recent soil vapor data that better reflect current conditions at the Site. Source area soil vapor concentrations reported for October/November 2011 generally had decreased from those reported in September 2008 and are considered more representative of current conditions. These concentrations and the 2012 soil vapor concentrations from monitoring well headspace are used as source concentrations where they are available and are above the reporting limit.

There is considerable uncertainty with soil vapor concentrations due to the variability of reporting limits associated with requisite dilutions of analytical samples. Additionally, some constituents are present at low concentrations in LNAPL and perched groundwater, resulting in vapor concentrations below analytical reporting limits.

3.1.2 Receptors

Land use in the area of the Site includes residential, commercial and industrial settings. The source property currently is an asphalt-paved parking lot. Commercial establishments are located immediately adjacent to the source property. The surrounding area is mixed-use residential and commercial (Figure B.3). The area over the projected extent of the VOC solute plume consists of 37% residential land use, 43% commercial land use and 20% roads and right of way (see Appendix A). Residential areas are predominantly in the northwest distal portion of the plume area and the proximal portion and the source property are overlain by commercial properties (Figure B.3).

Under current conditions, potential receptors on the source property would include people parking their cars and pedestrians crossing the site that could best be characterized as passers-by present for relatively short periods of time. The potential also exists under current conditions for utility workers to be present at the source property working in shallow excavations. It is assumed that such excavations would be five (5) feet or less in depth and associated with utility repair or maintenance around the perimeter of the source property where exiting utilities are located.

Potential receptors off of the source property, based on current land use, include residents and commercial/industrial workers. Receptors in a residential setting include both adults and children. While visitors to commercial establishments can include both adults and children, their presence would be of relatively brief duration at infrequent times. Therefore, the receptors of concern in commercial and industrial settings are adult employees who may be chronically exposed.

Based on the current land use (Figure B.3), residential receptors are located northwest of the source area overlying the groundwater solute plume and southeast of the source area overlying the LNAPL.

3.2 Exposure Pathways

The identification of potentially complete exposure pathways is based on the following four (4) components: 1) a source and mechanism of chemical release, 2) a retention or transport medium, 3) an exposure point (i.e., a setting where potential human contact with the chemical-affected medium or media occurs), and 4) a route of exposure at the exposure point (e.g., ingestion). A complete exposure pathway is present when all four of these components are present.

Based on the lack of current or reasonably anticipated future use of the perched groundwater as a water supply, the risk assessment does not consider exposures due to direct ingestion, inhalation or dermal contact with contaminated perched groundwater since these are not complete pathways at the Site.

Based on the distribution of contaminants in impacted media and the receptors identified at the Site, the potentially complete exposure pathways involve transport of vapor-phase contaminants to outdoor and indoor air with subsequent inhalation exposure. Additionally, a potentially complete exposure pathway includes a utility worker contacting soil contaminants in shallow excavations.

3.2.1 Conceptual Model of Exposure

The conceptual model of exposure summarizes the relationship between sources and impacted media, migration pathways and receptors at the Site to define completed exposure pathways to be considered in the risk assessment. Figure B.4 presents the conceptual model of exposure that provides a visual representation of the complete exposure pathways for the human receptors at the Site.

There are currently no structures on the source property, so vapor intrusion to indoor air is not a pathway of concern for this location.

3.3 Quantifying Exposures

Quantifying exposure involves the determination of exposure point concentrations (EPCs) in relevant environmental media for the identified receptors. The EPC is the chemical concentration in the exposure media to which the human receptors are assumed to be exposed. Representative EPCs are developed from soil, soil vapor and perched groundwater data for COPCs at relevant locations. EPCs are combined with relevant exposure factors to determine the exposure concentration for inhalation and the average daily intake for ingestion and dermal contact.

EPCs are determined either by calculating the 95^{th} percentile upper confidence limit on the mean or by taking the maximum reported concentration, depending on statistical characteristics of the data set such as the sample size and distribution and the presence of values below the reporting limit.

3.3.1 Vapor Transport

Vapor transport is predominantly by diffusion that is largely controlled by the air-filled porosity of the vadose zone. The emission flux to the ground surface is described by Fick's first law which assumes a constant source concentration and concentration gradient. This is a "conservative" representation that assumes a steady-state condition with no source depletion over time and the concentration gradient defined by the saturated vapor concentration and a vapor concentration of zero (0) at the ground surface. The emission flux (J) is calculated as:

$$J\left({}^{\mu g}\!/\!_{m^2 s}\right) = D_E \frac{\partial C_v}{\partial z} = D_E \frac{C_v}{d}$$

Where:

D_E	is the effective diffusion coefficient (diffusivity) for the vadose zone (m^2/s),
C_v	is the vapor concentration ($\mu g/m^3$) at the source, and
d	is the depth from the soil surface to the source (m).

The effective diffusivity (D_E) for an unsaturated porous media is calculated as:

$$D_E = \left[D_a \left(\frac{\theta_a^{10/3}}{\theta} \right) + \frac{D_w}{H'} \left(\frac{\theta_w^{10/3}}{\theta} \right) \right] \times 0.0001\, {}^{m^2}\!/\!_{cm^2}$$

Where:

D_a	is diffusivity in air (cm^2/s),
D_w	is diffusivity in water (cm^2/s),
H'	is the dimensionless Henry's law constant,
θ_a	is the air-filled porosity (cm^3/cm^3),
θ_w	is the water-filled porosity (cm^3/cm^3), and
θ	is the total porosity (cm^3/cm^3).

The diffusive flux model for the Site is represented as a one-layer system that assumes uniform properties for the vadose zone. The porosity of the matrix of the Fort Lowell Formation ranges from 0.26 to 0.30 (Davidson, 1973) and porosity measurements for silty and clayey sand at the adjacent Yellow Cab site yielded values of 0.32 with associated bulk densities of 1.79 – 1.81 g/cm^3 (B&R, 1998). Effective gas porosity estimates from a SVE pilot test on the source property ranged from 0.08 to 0.23 (HGC, 2006b); the higher end of the range is generally consistent with the reported vadose zone volumetric moisture content of 0.12 (B&R, 1998). Reasonably conservative representative parameter values used in vapor diffusion modeling are shown in Table B.5.

The source is assumed to be the concentration in soil vapor at a specified depth. For source concentrations from soil vapor probes on and adjacent to the source property, the source depth is taken to be the depth of the probe. For source concentrations from monitoring well headspace, the source depth is taken to be the top of the screened interval.

For the utility worker scenario, the source is assumed to be the concentration in shallow soil vapor <1.5 m (≤5 ft) and diffusion is assumed to occur laterally to the trench side-wall over a distance of 1 m.

3.3.1.1 Outdoor Air

The potential volatilization to outdoor air is evaluated using the one-layer diffusion model to estimate vapor mass flux to the surface combined with a mass-balance equation ("box" model) to represent mixing in the atmosphere. Effective diffusivity values for the vadose zone are calculated based on the parameter values in Table B.5 and the chemical parameter values from Table B.1.

An atmospheric "mixing zone" to account for the effect of the volatilization flux interacting with the atmosphere is represented by a simple "box" model that is based on a mass balance approach. The mass of the chemical entering the bottom of the mixing zone by diffusion is balanced against the mass of chemical leaving the mixing zone on the downwind side. The mixing zone represents the interaction with air moving horizontally at a constant velocity and yields the average concentration of the chemical in the atmospheric mixing zone.

The mass balance equation for the atmospheric mixing zone is:

$$J \times L \times W = V_w \times W \times H \times C_a$$

Where:

J	is the emission flux (µg/m^2-s),
L	is the length of the mixing zone parallel to the wind direction (m),
W	is the width of the mixing zone normal to the wind direction (m),
V_w	is the average wind speed (m/s),
H	is the height of the mixing zone (m), and
C_a	is the average chemical concentration in air (µg/m^3) in the mixing zone.

Algebraic rearrangement of the mass balance equation in terms of the average chemical concentration in air (C_a) and canceling like terms yields:

$$C_a = J \times \left(\frac{L}{V_w \times H} \right)$$

The site-specific parameters for defining the size of the mixing zone are based on a default height of 2 m (EPA, 1991) and the dimensions of the source property. The atmospheric mixing zone is represented as a square that is 200 feet (61 m) on a side and 2 m in height with an area slightly less than 1 acre. Typical average wind speeds for Tucson are 7.8 to 8.9 miles per hour (NCDC, 2013) and an average annual value of 3.71 m/s (8.3 mph) is used in the calculations.

The surface at the source property currently consists of an asphalt-paved parking lot. Asphalt pavements typically are considered to be impervious covers that effectively form a diffusion barrier (Coons and Wright, 1968). Aside from the fact that asphalt pavements frequently have cracks, they are porous media and recent studies indicate that the majority of air voids in the pavement are interconnected air channels existing from the top to the bottom of the specimen (Al-Omari et al., 2002; Masad, 2004; Masad et al., 2007). Interconnected air void content measurements range from 2% to 10% depending on mixture type, compaction effect, and other factors (Woo et al., 2007, 2008; Kassem et al., 2009). The current condition of the pavement at the source property is heavily weathered and cracked, but relatively high concentrations in shallow soil vapor probes suggest it is an effective barrier to diffusion. Due to the inherent uncertainty in quantifying its impact on volatilization, the presence of the asphalt is disregarded in the modeling, which is a conservative assumption that will tend to overestimate EPCs.

3.3.1.2 Trench

There is no "standard model" for representing volatilization to a trench that is accepted for utility worker exposure, and none that are formulated for soil vapor contamination as the source. Available representations are formulated to consist of a component to represent mass transfer to air in the trench and a component to represent mixing and dispersion in the trench (CCME, 2011). The latter is represented using a simple box model:

$$C_a = J \times \left(\frac{A \times 3600\, {}^{s}\!/\!_{hr}}{V \times ACH} \right)$$

Where:

C_a	is the average chemical concentration in air (µg/m^3) in the trench,
J	is the emission flux (µg/m^2-s),
A	is the exposed area of the trench (m^2),
V	is the volume of the trench (m^3), and
ACH	is the air exchange rate (hr^{-1}).

The trench is assumed to be 1 m wide and 1.5 m deep. The length of an open trench segment is taken to be 15 m (50 ft). These dimensions result in a trench volume of 22.5 m^3. The surface area exposed to contamination is 45 m^2 and represents the area of excavation sidewall open to vapor diffusion assuming both sides of the excavation are in contaminated soils. The air exchange rate for a trench with a depth greater than its width relative to the wind direction is taken to be 2 per hour based on urban canyon studies and reflect circulation cells within the trench that limit gas exchange with the atmosphere (CCME, 2011; VDEQ, 2010).

3.3.1.3 Indoor Air

Potential inhalation exposure to the indoor commercial/industrial worker and resident (adult and child) receptors are evaluated using the EPA implementation (EPA, 2004) of the Johnson and Ettinger (1991) model or an empirical attenuation factor (EPA, 2013) to estimate indoor air concentrations of VOCs from soil vapor and groundwater. The empirical attenuation factor is used in lieu of modeling for source concentrations based on shallow soil vapor samples at the source property that are essentially equivalent to sub-slab samples.

The current Tier 2 soil gas versions of the Johnson and Ettinger model are used to calculate indoor air EPCs. Site-specific information is used as input to the model. In the absence of site-specific information, EPA-recommended default input parameters are used (EPA, 2004). Predicted indoor air concentrations from the Johnson and Ettinger model are the EPCs for the COPCs at each location. Physicochemical parameters for cyclohexane, 4-ethyltoluene, heptane, tetrahydrofuran, and 2,2,4-trimethylpentane were added to the chemical lookup table in the Johnson and Ettinger model spreadsheet based on values in Table B.1 and phase change data from the NIST Chemistry WebBook (http://webbook.nist.gov/chemistry/).

Due to the heterogeneous nature of the alluvial deposits underlying the Site, the strata do not readily lend themselves to simple differentiation into up to three defined layers. Therefore, the screening versions of the models are used that treat the soil column as a single homogeneous layer. Parameter values for soil properties are selected based on representative data from the Site (Table B.5).

Vapor intrusion into buildings from underlying soils due to convection is a function of the effective gas permeability. Vertical gas permeability estimates for the upper part of the vadose zone from a SVE pilot test on the source property ranged from 0.6 to 3 darcies (HGC, 2006b). The high-end value of 3 darcies, which is equivalent to 3×10^{-8} cm^2, provides a reasonably conservative estimate for this parameter.

Recommended default values for building-related parameters (Table B.6) are used in the models since there is no substantive basis on which to determine site-specific values. The default values are based on those for a "typical" residential structure in terms of area and foundation structure (EPA, 2004).

Shallow soil vapor sample results from the source property are essentially equivalent to sub-slab concentrations and for these samples an empirical attenuation factor of 0.03 (EPA, 2013) is applied to estimate indoor air concentrations rather than using the Johnson and Ettinger model. The attenuation factor yields a more conservative estimate of potential indoor air concentrations for commercial worker exposure in adjacent buildings.

3.3.2 Off-site Residential

Due to the sparsity of data points and variation in concentrations relative to the apparent extent of contamination in soil vapor and perched groundwater, the use of average values for source concentrations would not be representative of potential exposures at a given residential setting. Therefore, estimates of indoor air EPCs are made based on maximum source concentrations reported at specific locations. The outdoor inhalation of VOCs in ambient air was not evaluated in this off-site residential exposure scenario since indoor air VOC concentrations are always higher than VOC levels in outdoor air.

Concentrations at 7AZP-6 are considered representative of the northwest portion overlying the solute plume. COPCs in this area include PCE, TCE, *cis*DCE and MTBE. PCE and TCE are reported in soil vapor and perched groundwater at this location; *cis*DCE and MTBE are below reporting limits in soil vapor and are currently present in groundwater at sub-µg/L concentrations. Measured soil vapor concentrations for PCE and TCE are used directly and equilibrium soil vapor concentrations for *cis*DCE and MTBE are calculated using Henry's law (Table B.7). Calculated values of indoor air concentrations at 7AZP-6 are given in Table B.7 and copies of the Johnson and Ettinger model spreadsheets for each COPC showing input values and results are provided in Appendix B.1.

Concentrations at MW-PD-6 are representative of the southeast portion of the site overlying the LNAPL. Only PCE was present above the reporting limit in soil vapor for this location. Calculated values of indoor air concentrations at MW-PD-6 are given in Table B.8 and copies of the Johnson and Ettinger model spreadsheets showing input values and results are provided in Appendix B.2.

3.3.3 Off-site Commercial/Industrial

The distribution of contaminants and variation in concentrations in soil vapor makes spatial averages unrepresentative for any particular exposure area (e.g., building). Therefore, estimates of indoor air EPCs are made based on maximum source concentrations reported at specific locations.

The properties immediately adjacent to the Site consist of commercial establishments including shops, commercial workspaces and an auto repair facility. The area in the immediate vicinity of the source property is represented by concentrations in shallow soil vapor samples (Figure B.5) around the periphery of the source property (all except SG-7-4' and SG-6-5') and vapor probes and monitoring well headspace at locations around the periphery of the source property (7AZP-1, 7AZP-2, 7AZP-3, YC-5) and nearby (7ZAP-8, MW-PD-14, MW-PD-29). COPCs in soil vapor for these locations are shown in Table B.9. No single location has reported consistently higher concentrations of all the COPCs. Therefore, a composite representation is used based on the locations with the highest reported concentration from the shallowest depth for each COPC from the most recent sampling rounds. Vinyl chloride has not been reported in soil vapor samples at the source property since 2002. However, the reporting limits in subsequent samples are elevated and the presence of vinyl chloride at these earlier reported concentrations cannot be dismissed. Calculated values of indoor air concentrations at selected locations and depths are given in Table B.9 and copies of the Johnson and Ettinger model spreadsheets showing input values and results for the modeled locations are provided in Appendix B.3. Indoor air concentrations for COPCs based on shallow soil vapor sample results are determined based on an empirical attenuation factor of 0.03.

Concentrations at YC-6 are representative of the area overlying the LNAPL away from the source property. COPCs in soil vapor for this location include PCE, TCE, 2-butanone and 1,4-dichlorobenzene, as well as petroleum-related constituents. Calculated values of indoor air concentrations at YC-6 are given in Table B.10 and copies of the Johnson and Ettinger model spreadsheets showing input values and results are provided in Appendix B.4.

Concentrations at MW-PD-1 are representative of the west-central portion overlying the solute plume. COPCs at this location include PCE, TCE, *cis*DCE and *trans*DCE, MTBE and toluene. The COPCs are present in soil vapor with the exception of MTBE which is below the reporting limit but present in groundwater. Available measured soil vapor concentrations are used directly and an equilibrium soil vapor concentration for MTBE is calculated using Henry's law (Table B.11). Calculated values of indoor air concentrations at MW-PD-1 are given in Table B.11 and copies of the Johnson and Ettinger model spreadsheets showing input values and results are provided in Appendix B.5.

3.3.4 On-Site Passer-By

The area of the source property is represented by concentrations in shallow soil vapor samples (Figure B.5) and in vapor probes and monitoring well headspace at 7AZP-1, 7AZP-2, 7AZP-3, 7AZP-4, and YC-5. The distribution of contaminants and variation in concentrations in soil vapor at the source property makes spatial averages unreliable. Therefore, estimates of outdoor air EPCs are made based on a composite representation is used based on the locations with the highest reported concentration from the shallowest depth for each COPC from the most recent sampling rounds. Vinyl chloride has not been reported in soil vapor samples at the source property since 2002. However, the reporting limits in subsequent samples are elevated and the presence of vinyl chloride at these earlier reported concentrations cannot be dismissed. Summary calculations for vapor diffusion and calculated values of outdoor air concentrations for the selected locations and depths are given in Table B.12.

3.3.5 On-Site Utility Worker

EPCs for the utility worker receptor are developed based on utility work being performed around the perimeter of the the source property. The relevant source concentrations are taken to be represented by shallow soil vapor samples around the periphery of the source property (Figure B.5). Based on the distribution of COPC concentrations, potential source concentrations can vary considerably depending on the specific location of a utility trench around the periphery of the source property. Therefore, the maximum reported concentrations for COPCs in shallow soil vapor are used as source concentrations so as not to underestimate potential risk. Summary calculations for vapor diffusion and calculated values of trench air concentrations for the selected locations are given in Tables B.13 and B.14.

3.4 Estimation of Exposure Concentrations

The approach for characterizing inhalation exposure involves the estimation of exposure concentrations (ECs) for each receptor exposed to contaminants via inhalation. ECs are time-weighted average concentrations derived from measured or modeled contaminant concentrations in air, adjusted based on the characteristics of the exposure scenario being evaluated, such as the exposure duration and frequency. The basic equation for estimating ECs is (EPA, 2009):

$$EC = \frac{C_a \times ET \times EF \times ED}{AT}$$

Where:

EC is the exposure concentration ($\mu g/m^3$),
C_a is the contaminant concentration in air ($\mu g/m^3$),

ET	is the exposure time (hours/day),
EF	is the exposure frequency (days/year),
ED	is the exposure duration (years), and
AT	is the averaging time.

The averaging time for evaluating cancer risk is based on the average lifetime with the appropriate time unit conversions (e.g., 70 years × 365 days/year × 24 hours/day = 613,200 hours). The averaging time for exposure to non-carcinogenic contaminants is based on the exposure duration associated with the exposure scenario (EPA, 2009).

Table B.15 presents the exposure parameters associated with the exposure pathways relevant to each receptor. The selected exposure parameters were intended to determine the reasonable maximum exposure (RME) for each receptor. Reasonable maximum exposure (RME) refers to people who are at the high end of the exposure distribution (approximately the 95th percentile) and is intended to assess exposures that are higher than average, but are still within a realistic range of exposure.

3.4.1 Residential Scenario

The residential scenario is assumed to consist of inhalation exposure for up to 24 hours per day, up to 350 days per year, for 6 to 30 years.

Calculated values of exposure concentrations for residential receptors at 7AZP-6 and MW-PD-6 are given in Tables B.7 and B.8, respectively.

3.4.2 Commercial/Industrial Occupational Scenario

This scenario is assumed to be characterized by a full-time adult worker (8 hours per day, 5 days per week) in an indoor setting exposed via inhalation. The exposure frequency is assumed to be 250 days per year, allowing for two weeks of vacation, over a duration of 25 years.

Calculated values of exposure concentrations for commercial workers adjacent to the source property and at YC-6 and MW-PD-1 are given in Tables B.9, B.10 and B.11, respectively.

3.4.3 Passers-by

Determining appropriate exposure parameters for passers-by on the source property is difficult due to the inherent variability that could be associated with assumed exposure. The type of receptor envisioned would be present on the property for only a short time each day; such as an adult who is employed in the vicinity and uses the parking lot on weekdays or an adult pedestrian who passes across the property going to and from work. The passer-by scenario is assumed to consist of inhalation exposure for 15 minutes per day, up to 250 days per year, for 25 years.

Calculated values of exposure concentrations for passers-by at the source property are given in Table B.12.

3.4.4 Utility Worker

Determining appropriate exposure parameters for utility workers is uncertain due to the inherent variability associated with such exposure scenarios. Utility workers would be present for much shorter periods of time than workers on a construction project due to the transient nature of utility installation and repair activities. The scenario used herein is based on a utility worker in a trench on a single project lasting 7 days where the worker is assumed to be present in the trench for 4 hours per day. The utility worker scenario consists of inhalation exposure for 4 hours per day, up to 7 days per week for 1 week.

In the context of non-cancer effects, this scenario would constitute acute or subchronic exposure (EPA, 2009). Acute and subcronic exposures are defined differently by U.S. EPA and ATSDR with respect to durations and the utility worker scenario is in the area of overlap. Therefore, exposure concentrations for both an acute exposure and a subchronic exposure are determined for comparative purposes. The exposure concentration is equal to the exposure point concentration for acute exposures.

Calculated values of exposure concentrations for utility workers at the source property are given in Table B.13 for acute exposure and Table B.14 for subchronic exposure.

4. TOXICITY ASSESSMENT

The toxicity assessment describes the toxic effects of the chemicals of concern at the site. These include both cancer and non-cancer toxic endpoints.

This section presents information on toxicity for the chemicals addressed in this HHRA,. Toxicological information was examined to determine appropriate toxicity values for use in developing screening levels and characterizing risk for the chemicals included in this evaluation. All toxicity values are derived using the most current toxicity values consistent with EPA's toxicity value hierarchy provided in OSWER Directive 9285.7-53 (EPA, 2003) and are summarized in Tables B.16 and B.17. The hierarchy of sources for toxicity values is 1) the EPA Integrated Risk Information System (IRIS) database, 2) EPA Provisional Peer Reviewed Toxicity Values (PPRTVs), and 3) other EPA and non-EPA sources (EPA, 2003). The other non-EPA sources include the Agency for Toxic Substances and Disease Registry (ATSDR), California Environmental Protection Agency (CalEPA) and other peer-reviewed sources.

4.1 Toxicity Values

The basic toxicity value for non-cancer effects is the reference dose (RfD) that defines a daily intake of a chemical, normalized to body weight, that is not expected to result in adverse effects over a lifetime. RfDs are expressed in units of mg/kg-day and are applicable to a particular route of exposure such as the oral route (RfD_o). For inhalation exposures, EPA uses the inhalation reference concentration (RfC) for non-cancer toxicity of inhaled chemicals (EPA, 1994). RfCs are conceptually similar to RfDs, but account for animal species differences in the dynamics of the respiratory system as the portal of entry and are expressed in units of mg/m^3. A variety of other terms are used to describe toxicity values essentially equivalent to RfDs and RfCs, such as ASTDR minimal risk levels (MRLs).

The basic toxicity value for carcinogenic effects is the cancer slope factor (CSF) that provides the upper-bound estimates of the probability of a response per unit intake of a chemical over a lifetime. Slope factors are expressed in units of (mg/kg-day)$^{-1}$ and are applicable to a particular route of exposure such as the oral route (SFo). For inhalation exposures, the inhalation unit risk (IUR) is used and provides an estimated upper-bound excess lifetime cancer risk resulting from continuous exposure to an agent at a concentration of 1 µg/m^3 in air. Inhalation unit risk values are expressed in units of (µg/m^3)$^{-1}$.

The chronic toxicity values used herein are summarized in Table B.16. Consistent with OSWER Directive 9285.7-53 (EPA, 2003), available current toxicity values used in this HHRA are taken from the EPA Regional Screening Table (EPA, 2012b) to the extent they are available. Values used for acute and subchronic toxicity for selected chemicals relevant to the utility worker scenario are summarized in Table B.17. These values were obtained from the current listing on the Risk Assessment Information System (RAIS, 2013).

5. RISK CHARACTERIZATION

This section quantitatively characterizes the human health risks associated with completed exposure pathways. Cancer risks and non-cancer health hazards are presented for the complete exposure pathways identified in Section 3. The NCP risk management range of 10^{-4} to 10^{-6} for carcinogenic risk and 1.0 for the non-cancer health hazard are used to evaluate the relative magnitude of risk calculated for the complete exposure pathways. For constituents that have both carcinogenic and non-cancer effects, both cancer risk and non-cancer health hazard are calculated and included in the summed estimates.

5.1 Cancer Risk

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen (i.e., incremental or excess individual lifetime cancer risk). Chemical-specific excess cancer risks are summed to calculate the total excess cancer risk (EPA, 1989).

The excess cancer risk for a receptor exposed via the inhalation pathway is estimated with the following equation:

$$Risk = IUR \times EC$$

Where:

IUR	is the inhalation unit risk value from Table B.15 and
EC	is the exposure concentration ($\mu g/m^3$).

For the residential scenario where children are potential receptors, evaluation of chemicals with mutagenic mode of action addresses the potential for differential carcinogenic potency in early life stages. Chemical-specific information is used to develop cancer slope factors that address this potential if appropriate data are available; otherwise, the following default age-dependent adjustment factors (ADAFs) are applied to the cancer slope factor (EPA, 2005):

- a 10-fold adjustment for ages 0 to <2 years;
- a 3-fold adjustment for ages 2 to <16 years;
- no adjustment for ages 16 years and older.

Currently, vinyl chloride is the only chemical with appropriate dose-response data for evaluating the differential susceptibility from early life exposure (EPA, 2000). In the case of TCE, EPA suggests that the kidney risk be assessed by applying the ADAFs to the adult-based unit risk estimate to account for increased early-life susceptibility and that the liver and non-Hodgkin lymphoma be addressed using the standard cancer equations (EPA, 2011).

5.2 Non-Cancer Health Hazard

The measure used to describe the potential for non-carcinogenic toxicity to occur in an individual is not expressed as the probability of an individual suffering an adverse effect. Rather, the non-cancer hazard quotient (HQ) assumes that there is a level of exposure (i.e., RfD or RfC) below which it is unlikely for even sensitive populations to experience adverse health effects. If the exposure level exceeds this threshold (e.g., HQ > 1), there may be concern for potential non-cancer effects. Chemical-specific HQs are summed to calculate the hazard index (HI) (EPA, 1989). The HI is the value compared to the EPA non-cancer criterion of 1.

The HQ for a receptor exposed via the inhalation pathway is estimated with the following equation:

$$HQ = \frac{EC}{RfC \times 1000 \, {}^{\mu g}\!/_{mg}}$$

Where:

EC	is the exposure concentration (µg/m^3) and
RfC	is the reference concentration value from Table B.15.

5.3 Risk/Hazard Associated with Vapor Intrusion

Excess cancer risks and HQs are evaluated separately for both the slab-on-grade and basement scenarios.

5.3.1 Off-Site Residential Exposure

Summary calculations of excess cancer risk and HQs for exposures at 7AZP-6 are shown in Table B.18. For the slab-on-grade scenario, calculated excess cancer risks for the individual chemicals at this location range from 2.6×10^{-9} to 4.7×10^{-7} and the total excess cancer risk estimate is 7.5×10^{-7}; calculated HQs for non-cancer health effects range from 7.8×10^{-6} to 1.3×10^{-1} and the HI for non-cancer effects is 1.9×10^{-1}. For the basement scenario, calculated excess cancer risks for the individual chemicals at this location range from 2.8×10^{-9} to 5.3×10^{-7} and the total excess cancer risk estimate is 8.5×10^{-7}; the calculated HQs for non-cancer health effects range from 8.5×10^{-6} to 1.5×10^{-1} and the HI for non-cancer effects is 2.2×10^{-1}. The results show that the human health risks are less than the accepted *de minimis* targets of 10^{-6} excess cancer risk and HI of 1 for non-cancer health effects for both scenarios at this location. Consideration of the ADAF adjustment for TCE cancer risk using EPA's spreadsheet indicates little impact on the risk estimate (Table B.19) and does not significantly impact the total excess cancer risk estimate.

Summary calculations of excess cancer risk and HQs for PCE exposure at MW-PD-6 are shown in Table B.20. Calculated excess cancer risk at this location for the slab-on-grade scenario is 8.9×10^{-7} and for the basement scenario is 1.0×10^{-6}. The calculated HQs for non-cancer health effects are 2.0×10^{-1} and 2.3×10^{-1} for the slab-on-grade and basement scenarios, respectively. The results show that for both scenarios the excess cancer risk for PCE is marginally less than or equal to the accepted *de minimis* target of 1×10^{-6} and HI is less than the target value of 1 for non-cancer health effects at this location.

5.3.2 Commercial Worker

Summary calculations of excess cancer risk and HQs for exposures adjacent to the source property are shown in Table B.21. For the slab-on-grade scenario, calculated excess cancer risks for the individual chemicals range from 9.5×10^{-9} to 5.3×10^{-5}; calculated HQs for non-cancer health effects range from 2.9×10^{-6} to 14. For the basement scenario, calculated excess cancer risks for the individual chemicals range from 1.0×10^{-8} to 5.3×10^{-5}; calculated HQs for non-cancer health effects range from 2.7×10^{-6} to 14. Due to the composite nature of the exposure concentrations, use of additivity is not strictly appropriate since the exposure concentrations are derived from different specific locations. However, the following summed values are provided for comparative purposes. The total excess cancer risk estimates for both the slab-on-grade and basement scenarios are 7.6×10^{-5}. Similarly, the HIs for non-cancer effects for both the slab-on-grade basement scenarios are 21. The results show that for both scenarios the human health risks are substantially greater than the accepted *de minimis* targets of 10^{-6} excess cancer risk and HI of 1 for non-cancer health effects. The health risks are primarily driven by PCE and TCE and are likely overstated by using the maximum soil vapor concentration. Attendant cancer risk and health hazard estimates for PCE and TCE at each of the shallow soil vapor probe locations (Figure B.5) around the source property periphery are provided in Table B.22 to illustrate the range of values associated with these constituents.

Summary calculations of excess cancer risk and HQs for exposures at YC-6 are shown in Table B.23. For the slab-on-grade scenario, calculated excess cancer risks for the individual chemicals at this location range from 6.2×10^{-10} to 1.0×10^{-9} and the total excess cancer risk estimate is 3.1×10^{-9}. Calculated HQs for non-cancer health effects range from 2.3×10^{-7} to 2.7×10^{-4} and the

HI for non-cancer effects is 5.4×10^{-4}. For the basement scenario, calculated excess cancer risks for the individual chemicals at this location range from 6.8×10^{-10} to 1.1×10^{-9} and the total excess cancer risk estimate is 3.5×10^{-9}. The calculated HQs for non-cancer health effects range from 2.5×10^{-7} to 3.0×10^{-4} and the HI for non-cancer effects is 6.1×10^{-4}. The results show that for both scenarios the human health risks are several orders of magnitude less than the accepted *de minimis* targets of 10^{-6} excess cancer risk and HI of 1 for non-cancer health effects at this location.

Summary calculations of excess cancer risk and HQs for exposures at MW-PD-1 are shown in Table B.24. For the slab-on-grade scenario, calculated excess cancer risks for the individual chemicals at this location range from 3.0×10^{-10} to 6.2×10^{-8} and the total excess cancer risk estimate is 9.4×10^{-8}. Calculated HQs for non-cancer health effects range from 8.7×10^{-7} to 2.1×10^{-2} and the HI for non-cancer effects is 3.0×10^{-2}. For the basement scenario, calculated excess cancer risks for the individual chemicals at this location range from 3.1×10^{-10} to 6.8×10^{-8} and the total excess cancer risk estimate is 1.1×10^{-7}. The calculated HQs for non-cancer health effects range from 9.5×10^{-7} to 2.3×10^{-2} and the HI for non-cancer effects is 3.4×10^{-2}. The results show that for both scenarios the human health risks are substantially less than the accepted *de minimis* targets of 10^{-6} excess cancer risk and HI of 1 for non-cancer health effects at this location.

5.4 Risk/Hazard Associated with Outdoor Air

The excess cancer risks and HQs associated with outdoor air inhalation exposure by passers-by at the source property are summarized in Table B.25. Calculated excess cancer risks for the individual chemicals at this location range from 4.7×10^{-13} to 6.6×10^{-10} and the total excess cancer risk estimate is 1.2×10^{-9}. Calculated HQs for non-cancer health effects range from 5.4×10^{-10} to 1.8×10^{-4} and the HI for non-cancer effects is 3.4×10^{-4}. The results show that the human health risks are several orders of magnitude less than the accepted *de minimis* targets of 10^{-6} excess cancer risk and HI of 1 for non-cancer health effects for this scenario.

5.5 Risk Characterization for Utility Workers

The excess cancer risks and HQs associated with outdoor air inhalation exposure by a utility worker in a trench at the source property are summarized in Table B.26 for acute exposure and Table B.27 for subchronic exposure. Calculated excess cancer risks for the individual chemical associated with this scenario range from 2.8×10^{-11} to 1.3×10^{-9} and the total excess cancer risk estimate is 2.1×10^{-9}. The results show that cancer risks for this scenario are several orders of magnitude less than the accepted *de minimis* target of 10^{-6} excess cancer risk. Calculated HQs for acute non-cancer effects range from 8.3×10^{-6} to 8.0×10^{-2} and the HI is 8.4×10^{-2}. Calculated HQs for subchronic non-cancer effects range from 3.5×10^{-6} to 4.4×10^{-4} and the HI is 6.6×10^{-4}. These results show that acute and subchronic effects for this scenario are several orders of magnitude less than the accepted target HI of 1 for non-cancer health hazard.

6. UNCERTAINTY ANALYSIS

This section provides a qualitative evaluation of key uncertainties pertaining to risk characterization at the site. The available information and results do not warrant a quantitative evaluation.

Key uncertainties related to risk assessment include the development of exposure concentrations, choice of toxicity value, lack of quantitative toxicity information, and the approach to estimating and aggregating risks. The most significant uncertainties in the exposure assessment, and in this risk assessment as a whole, are associated with the estimation of exposure concentrations.

6.1 Exposure Pathways

There is some uncertainty associated with not explicitly addressing inhalation exposure to outdoor air in a residential setting. However, vapor intrusion is conservative with respect to inhalation exposures and effectively accounts for potential exposure by this pathway since the net exposure would be reduced by allocating some of the exposure time to outdoor exposure. Therefore, the associated human health risk is likely overstated for residential inhalation exposures.

6.2 Development of Exposure Concentrations

Soil vapor concentrations are dynamic and short-term variation is evident in sampling results from the Site. Since soil vapor concentrations are the source term for the modeling, the variation introduces moderate uncertainty into the estimated EPCs. In general, the variability should not result in underestimation of the associated health risk since maximum reported concentrations were used.

The use of maximum reported concentrations in soil vapor and perched groundwater as source concentrations should result in an overestimation of the associated risk since actual risk is better-reflected by the average concentration in the exposure media. The fact that the maximum concentrations from recent sampling rounds are point estimates introduces uncertainty into the risk estimates because they do not account for variation over time.

The total mass of VOCs in the subsurface at the source property is poorly defined and it is unclear that sufficient mass exists to maintain VOC concentrations in soil vapor over a 25- or 30-year exposure period. In general, contaminant concentrations have decreased over time. This introduces uncertainty into the risk evaluation, but would tend to overestimate exposure concentrations and associated risk estimates.

COPCs previously noted in LNAPL from MW-PD-6 include trichloroethene and several petroleum hydrocarbon COPCs (Kleinfelder, 2003; HGC, 2006a) that can reasonably be expected to be present in soil vapor at this location. However, they are not reported from soil vapor samples and data are lacking that would allow estimation of vapor concentrations associated with the LNAPL. These constituents are not included in the risk estimates for this location, which introduces some uncertainty.

The use of modeling to determine the concentrations for contaminants in air introduces uncertainty into the calculations of exposure concentrations. The major source of uncertainty is related to the representation of transport processes and model parameters. The vapor diffusion models used are a steady-state representation that does not account for source depletion. This representation is a conservative predictor of air concentrations over time. Additionally, for petroleum hydrocarbon compounds the simple vapor diffusion representation commonly yields unrealistic results because this model does not consider the effects of biodegradation in the vadose zone. Petroleum hydrocarbon compounds are readily biodegraded by subsurface bacteria and in the presence of aerobic conditions, such as are encountered in the vadose zone, hydrocarbon vapors can be significantly attenuated (Ostendorf and Kampbell, 1991; Hers *et al.,* 2000; Roggemans *et al.*, 2002). The net impact of these considerations would be to reduce potential exposure concentrations and associated health effects.

The most critical parameters controlling volatilization estimates in the diffusion model are those related to the air-filled porosity. The air-filled porosity is the dominant control on the value of the effective diffusion coefficient. Air-filled porosity is a function of the soil moisture content. The values used for vapor diffusion parameters are reasonably conservative for the Site and unlikely to under-represent contaminant fluxes. Results of the SVE pilot test (HGC, 2006b) indicated site-scale heterogeneity in pneumatic parameters, which introduces some uncertainty into the diffusion flux estimates. However, the values selected for the modeling bias the results toward a higher diffusive flux that produces higher estimated EPCs.

Disregarding the presence of the asphalt in the parking lot at the source property introduces uncertainty into the passer-by scenario. The asphalt appears to be an effective barrier to volatilization based on the relatively high shallow soil vapor concentrations encountered below it and would be expected to substantially reduce diffusive flux resulting in lower exposure point concentrations. The net impact to the risk characterization for the passer-by scenario likely is to significantly overstate the potential human health risk. The uncertainty associated with attempting to incorporate consideration of the asphalt in the modeling would also be significant and would not change the conclusion of the risk characterization.

The Johnson and Ettinger model is a relatively simplistic representation of vapor intrusion into buildings and does not consider many of the complexities that would affect indoor air concentrations of COPCs. In general, there is relatively high uncertainty associated with the model results. The major source of uncertainty is related to building characteristics and operations that can vary widely.

Leaky buildings, in particular older buildings in Tucson, generally lack adequate insulation and vapor barriers that would contain contaminants. Therefore, these buildings likely exhibit higher air exchange rates than are accounted for in the Johnson and Ettinger model, resulting in overestimation of exposure concentrations. In the case of the auto repair facility immediately adjacent to the Site on the south, such establishments commonly have open bay doors that provide increased ventilation. Even when closed, such bay doors provide for significant air leakage.

The average vapor flow rate into a building is a source of uncertainty in the Johnson and Ettinger modeling. The pressure-driven gas flow rate into the building (Q_{soil}) calculated by the "perimeter crack model" (Nazaroff, 1992) in the EPA spreadsheets is 1.76 liters per minute (L/m) for the slab-on-grade scenario and 1.21 L/m for the basement scenario, which are at the low end of the range for coarse-grained soils from tracer tests of 1 - 10 L/m (EPA, 2004). Based on the default building ventilation rates (Q_b), the combination of parameters used in the modeling yields a Q_{soil}/Q_b ratio of 0.0017 for the slab-on-grade scenario and 0.0008 for the basement scenario that fall in the range of reasonable values (0.0001 – 0.01; Johnson, 2002).

Use of the empirical attenuation factor in estimating indoor air concentrations from shallow soil vapor concentrations introduces uncertainty into the risk estimates since it represents the 95th percentile value for a residential building and is intended for screening rather than site-specific evaluation (EPA, 2013). While the empirical attenuation factor of 0.03 can be considered appropriate for estimating a reasonable "worst case" indoor air concentration, the majority of structures would be expected to exhibit lower indoor air concentrations. Therefore, use of this attenuation factor likely overstates associated EPCs and attendant risk estimates, perhaps by an order of magnitude.

The use of a default residential structure to represent commercial buildings contributes to uncertainty regarding the results for this scenario. The impact of using a residential structure for the commercial scenario may be significant due to the inherent variability in commercial building structure and operation and may either overestimate or underestimate EPCs.

The predicted air concentrations in the atmospheric mixing zone are related to the size of the mixing zone. In the calculations herein, the exposure area is assumed to be the area immediately over the source area which is realistic for the exposure area. Variability in reported average wind speed is small and the associated uncertainty is relatively low.

The predicted air concentrations in a utility trench involve considerable uncertainty due to the inherent variability associated with trench construction. The air exchange rate is highly variable and largely controls predicted air concentrations in the box model employed herein. Factors affecting the air exchange rate include trench configuration and wind speed and direction with respect to the trench orientation. Values in the literature range from 2 to 360 air changes per hour (CCME, 2011; VDEQ, 2010), with little or no scientific basis for the values used. The use of an air exchange rate of 2 per hour in the modeling is thought to be conservative and unlikely to understate the attendant trench air concentrations.

Incomplete or low-quality data for time-activity patterns introduces uncertainty into the estimation of the exposure concentrations. This is particularly the case for the passer-by and utility worker scenarios which are based on hypothetical estimates rather than on data. The activity patterns used for the exposure scenarios represent high-end exposure frequency and duration. Therefore, the uncertainty associated with activity patterns is unlikely to underestimate the actual exposure at the Site which is likely to be much lower.

6.3 Toxicology

Some uncertainty is inherent in the toxicity values used to quantify potential systemic and carcinogenic effects. Non-cancer toxicity values for systemic effects are derived using available toxicity information and standard uncertainty factors that are assigned based on the quality of the available data. The uncertainty factors incorporated into the RfDs and RfCs used herein are not listed in this report, but can be obtained from the source of the RfD (e.g., IRIS, PPRTV documents). RfDs and RfCs do not have equal accuracy or precision and are not based on the same severity of toxic effects. Normally, the most sensitive endpoints are used to establish the toxicity values; however, there are other potential endpoints and effects that may or may not be accounted for depending on data availability. The cancer slope factor and inhalation unit risk generally are an upper-bound estimate of the probability of response such that that the "true risk" will not exceed the risk estimate derived through the linear low-dose model and is likely to be less than that predicted (EPA, 1989).

Recommended toxicity values, particularly provisional values, change over time as additional information becomes available and (re)assessments are performed. Thus, the toxicity values used in this HHRA reflect currently accepted values that may be revised upward or downward in the future.

Performing simple route-to-route extrapolation is generally not appropriate because hazard may be misrepresented when data from one route are substituted for another without any consideration of the pharmacokinetic differences between the routes (EPA, 2009). The IURs for chloroform and 1,2-dichloroethane were developed through route-to-route extrapolation from oral CSFs which introduces additional uncertainty into the risk calculations for these compounds. The IUR for both chloroform and 1,2-dichloroethane was calculated from oral route based on gavage data, assuming 100% absorption and metabolism at the low dose (EPA, 1985; 1987). The major urinary metabolites (in rats) of ingested and inhaled 1,2-dichloroethane are identical and generated in the same relative amounts (Reitz et al., 1982), suggesting similar metabolism regardless of route. For chloroform, extrapolation of metabolism-dependent carcinogenic responses from mice to humans on the basis of body surface area is supported by experimental data. Based on the limited data available, the uncertainty associated with the route-to-route extrapolation for these chemicals is moderate to high, but is unlikely to understate the associated risk.

There is uncertainty in the risk associated with the COPCs that lack inhalation toxicity data since they are not included in the quantitative risk estimates. These include the butylbenzene isomers, 1,3-dichlorobenzene, *cis*-1,2-dichloroethene, 1,3-dichloropropane, ethyl acetate, 4-ethyltoluene, heptane, *p*-isopropyltoluene, methylcyclohexane, octane, 1,3,5-trimethylbenzene and 2,2,4-trimethylpentane. Since the available calculated HQs generally are in a range that is several orders of magnitude less than one (1), the impact of the lack of toxicity values for these chemicals on the risk characterization is likely minimal in the context of the risk characterization and the calculated HI values.

The available RfC values for alkylbenzenes in this evaluation are all within slightly more than an order of magnitude, suggesting that the butylbenzenes, 4-ethyltoluene, *p*-isopropyltoluene and 1,3,5-trimethylbenzene might fall in the same range. Additionally, the calculated exposure concentrations for the alkylbenzenes fall within an order of magnitude range and the available calculated HQs are in a range that is several orders of magnitude less than one (1). In the context of the risk characterization and the calculated HI values, the impact of the lack of toxicity values for these chemicals on the risk characterization is likely minimal.

The potential magnitude of the health hazard associated with the alkanes is relatively low, based on structurally analogous chemicals. The available RfC values for alkanes in this evaluation are all within slightly more than an order of magnitude, suggesting that heptane, methylcyclohexane, octane and 2,2,4-trimethylpentane might fall in the same range. In the context of the risk characterization and the calculated HI values, the impact of the lack of toxicity values for these chemicals on the risk characterization is likely minimal.

6.4 Risk Models

EPA guidelines indicate that carcinogenic risks should be treated as additive and that noncancer hazard indices should also be treated as additive (EPA, 1989). These assumptions are made herein to help prevent an underestimation of cancer risk or potential non-cancer health effects at the Site.

Use of the additivity model for non-cancer effects introduces uncertainty into the risk characterization. Most of the hazard quotients (HQs) calculated for individual chemicals should be considered reasonably reliable, depending on the reliability of the specific components. However, as HQs are added together across different chemicals to yield a HI, certainty declines. Beyond the inherent uncertainty associated with RfDs and RfCs discussed previously, the assumption of dose additivity is most properly applied to compounds that induce the same effect by the same mechanism of action. The assumption of dose additivity ignores possible synergisms or antagonisms among chemicals, and assumes similarity in mechanisms of action and metabolism. No synergistic or antagonistic interactions are known for the chemicals in this assessment. Consequently, application of the hazard index equation to a number of compounds that are not expected to induce the same type of effects or that do not act by the same mechanism can overestimate the potential for effects. Based on the calculated hazard indices for the exposure scenarios examined being substantially less than one (1), the aggregate hazard is below levels of concern and the uncertainty associated with the additivity assumption has little impact on the risk characterization.

Use of the additivity assumption for cancer risk characterization introduces little uncertainty since risk evaluation is based on the increased incidental risk of cancer rather than the risk for a particular type of cancer.

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8. LIMITATIONS

The opinions and recommendations presented in this report are based upon the scope of services and information obtained through the performance of the services, as agreed upon by HGC and ADEQ. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. This report is expressly for the sole and exclusive use of ADEQ and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

TABLES

TABLE B.1
Physicochemical Properties for Reported Chemicals

Analyte	CAS No.	MW (g/mol)	S (mg/L)	H (atm-m^3/mole)	Koc (L/kg)	Da (cm^2/s)	Dw (cm^2/s)
Acetone	67-64-1	58.08	1.00E+06	3.50E-05	2.36E+00	1.06E-01	1.15E-05
Acrolein	107-02-8	56.06	2.12E+05	1.22E-04	1.00E+00	1.12E-01	1.22E-05
Benzene	71-43-2	78.11	1.79E+03	5.55E-03	1.46E+02	8.95E-02	1.03E-05
Bromodichloromethane	75-27-4	163.83	3.03E+03	2.12E-03	3.18E+01	5.63E-02	1.07E-05
1,3-Butadiene	106-99-0	54.09	7.35E+02	7.36E-02	3.96E+01	1.00E-01	1.03E-05
2-Butanone (MEK)	78-93-3	72.11	2.23E+05	5.69E-05	4.51E+00	9.14E-02	1.02E-05
n-Butylbenzene	104-51-8	134.22	1.18E+01	1.59E-02	1.48E+03	5.28E-02	7.33E-06
sec-Butylbenzene	135-98-8	134.22	1.76E+01 (A)	1.38E-02 (D)	1.33E+03 (G)	5.28E-02 (G)	7.34E-06 (G)
tert-Butylbenzene	98-06-6	134.22	2.95E+01 (A)	1.32E-02 (E)	1.00E+03 (G)	5.30E-02 (G)	7.37E-06 (G)
Carbon disufide	75-15-0	76.13	2.16E+03	1.44E-02	2.17E+01	1.06E-01	1.30E-05
Chloroform	67-66-3	119.38	7.95E+03	3.67E-03	3.18E+01	7.69E-02	1.09E-05
Chloromethane	74-87-3	50.49	5.32E+03	8.82E-03	1.32E+01	1.24E-01	1.36E-05
Cyclohexane	110-82-7	84.16	5.50E+01	1.50E-01	1.46E+02	8.00E-02	9.11E-06
Dibromochloromethane	124-48-1	208.28	2.70E+03	7.83E-04	3.18E+01	3.66E-02	1.06E-05
1,2-Dichlorobenzene	95-50-1	147	1.56E+02	1.92E-03	3.83E+02	5.62E-02	8.92E-06
1,3-Dichlorobenzene	541-73-1	147	1.25E+02 (B)	2.80E-03 (F)	3.00E+02 (H)	5.58E-02 (G)	8.85E-06 (G)
1,4-Dichlorobenzene	106-46-7	147	8.13E+01	2.41E-03	3.75E+02	5.50E-02	8.68E-06
Dichlorodifluoromethane (Freon 12)	75-71-8	120.91	2.80E+02	3.43E-01	4.39E+01	7.60E-02	1.08E-05
1,1-Dichloroethane	75-34-3	98.96	5.04E+03	5.62E-03	3.18E+01	8.36E-02	1.06E-05
1,2-Dichloroethane	107-06-2	98.96	8.60E+03	1.18E-03	3.96E+01	8.57E-02	1.10E-05
1,1-Dichoroethene	75-35-4	96.94	2.42E+03	2.61E-02	3.18E+01	8.63E-02	1.10E-05
cis-1,2-Dichloroethene	156-59-2	96.94	6.41E+03	4.08E-03	3.96E+01	8.84E-02	1.13E-05
trans-1,2-Dichloroethene	156-60-5	96.94	4.52E+03	4.08E-03	3.96E+01	8.76E-02	1.12E-05
1,3- Dichloropropane	142-28-9	112.99	2.75E+03	9.76E-04	7.22E+01	7.39E-02	9.82E-06
Ethyl Acetate	141-78-6	88.11	8.00E+04	1.34E-04	5.58E+00	8.23E-02	9.70E-06
Ethylbenzene	100-41-4	106.17	1.69E+02	7.88E-03	4.46E+02	6.85E-02	8.46E-06
4-Ethyltoluene	622-96-8	120.19	9.49E+01 (A)	4.92E-03 (D)	- -	6.03E-02 (I)	7.86E-06 (I)
Heptane	142-82-5	100.2	3.40E+00 (A)	2.27E+00 (D)	2.40E+02 (G)	6.49E-02 (G)	7.59E-06 (G)
n-Hexane	110-54-3	86.18	9.50E+00	1.80E+00	1.32E+02	7.31E-02	8.17E-06
2-Hexanone (MBK)	591-78-6	100.16	1.72E+04	9.32E-05	1.50E+01	7.04E-02	8.44E-06
Isopropylbenzene (Cumene)	98-82-8	120.2	6.13E+01	1.15E-02	6.98E+02	6.03E-02	7.86E-06
p-Isopropyltoluene	99-87-6	134.21	2.34E+01 (C)	7.90E-03 (D)	1.12E+03 (G)	5.27E-02 (G)	7.32E-06 (G)
Methylcyclohexane	108-87-2	98.19	1.40E+01 (D)	3.95E-01 (D)	2.34E+02 (G)	7.00E-02 (G)	8.27E-06 (G)
Methyl *tert*-butyl ether (MTBE)	1634-04-4	88.15	5.10E+04	5.87E-04	1.16E+01	7.53E-02	8.59E-06
Methylene chloride	75-09-2	84.93	1.30E+04	3.25E-03	2.17E+01	9.99E-02	1.25E-05
Naphthalene	91-20-3	128.18	3.10E+01	4.40E-04	1.54E+03	6.05E-02	8.38E-06
n-Nonane	111-84-2	128.26	2.20E-01	3.40E+00	7.96E+02	5.14E-02	6.77E-06
Octane	111-65-9	114.23	~0.7 (D)	2.96E+00 (D)	- -	- -	- -
2-Propanol (Isopropyl alcohol)	67-63-0	60.1	1.00E+06	8.10E-06	1.53E+00	1.03E-01	1.12E-05
Propene	115-07-1	42.08	2.00E+02	1.96E-01	2.17E+01	1.10E-01	1.07E-05
n-Propylbenzene	103-65-1	120.2	5.22E+01	1.05E-02	8.13E+02	6.02E-02	7.83E-06
Styrene	100-42-5	104.15	3.10E+02	2.75E-03	4.46E+02	7.11E-02	8.78E-06
1,1,2,2-Tetrachloroethane	79-34-5	167.85	2.83E+03	3.67E-04	9.49E+01	4.89E-02	9.29E-06
Tetrachloroethene	127-18-4	165.83	2.06E+02	1.77E-02	9.49E+01	5.05E-02	9.46E-06
Tetrahydrofuran	109-99-9	72.11	1.00E+06	7.05E-05	1.08E+01	9.54E-02	1.08E-05
Toluene	108-88-3	92.14	5.26E+02	6.64E-03	2.34E+02	7.78E-02	9.20E-06
1,2,4-Trichlorobenzene	120-82-1	181.45	4.90E+01	1.42E-03	1.36E+03	3.96E-02	8.40E-06
1,1,2-Trichloroethane	79-00-5	133.41	4.59E+03	8.24E-04	6.07E+01	6.69E-02	1.00E-05
Trichloroethene	79-01-6	131.39	1.28E+03	9.85E-03	6.07E+01	6.87E-02	1.02E-05
Trichlorofluoromethane	75-69-4	137.37	1.10E+03	9.70E-02	4.39E+01	6.54E-02	1.00E-05
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	187.38	1.70E+02	5.26E-01	1.97E+02	3.76E-02	8.59E-06
1,2,4-Trimethylbenzene	95-63-6	120.2	5.70E+01	6.16E-03	6.14E+02	6.07E-02	7.92E-06
1,3,5-Trimethylbenzene	108-67-8	120.2	4.82E+01	8.77E-03	6.02E+02	6.02E-02	7.84E-06
2,2,4-Trimethylpentane	540-84-1	114.23	2.40E+00 (D)	3.26E+00 (D)	2.40E+02 (G)	5.74E-02 (G)	7.06E-06 (G)
Vinyl chloride	75-01-4	62.5	8.80E+03	2.78E-02	2.17E+01	1.07E-01	1.20E-05
Xylenes (total)	1330-20-7	106.17	1.06E+02	5.18E-03	3.83E+02	8.47E-02	9.90E-06
m-Xylene	108-38-3	106.17	1.62E+02	6.90E-03	3.75E+02	6.82E-02	8.42E-06
o-xylene	95-47-6	106.17	1.61E+02	7.18E-03	3.75E+02	6.84E-02	8.44E-06
p-Xylene	106-42-3	106.17	1.78E+02	5.18E-03	3.83E+02	6.89E-02	8.53E-06

Notes:

MW = molecular weight; S = aqueous solubility; H = Henry's law constant; Koc = organic carbon-water partitioning coefficient; Da = air diffusion coefficient; Dw = water diffusion coefficient

- - = not available

Values taken from US EPA Regional Screening Levels table (Nov 2012) except where noted

(A) Yalkowsky SH, He Y (2003) Handbook of Aqueous Solubility Data. CRC Press LLC, Boca Raton, FL p.434

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TABLE B.2
Identification of COPCs in Soil

Analyte	CAS No.	Frequency	%	Reporting Limits	Reported Concentrations		Location of Maximum	Industrial Soil RSL		Screening Level	AZ SRL	COPC	Rationale
					Minimum	Maximum		Cancer	Non-cancer				
n-Butylbenzene	104-51-8	7/68	10.29412	0.050 - 0.25	0.14	2.3	7AZP-2	- -	5.10E+04	5100	240	No	maximum reported concentration less than screening level
sec-Butylbenzene	135-98-8	6.68	8.823529	0.050 - 0.25	0.32	2	7AZP-2	- -	- -	- -	220	Yes	frequency of reporting > 5%; uncertain toxicity
Ethylbenzene	100-41-4	1/68	1.470588	0.050 - 0.050	0.098	0.098	7AZP-3	2.70E+01	2.10E+04	27	400	No	frequency of reporting < 5%; maximum reported concentration less than screening level
p-Isopropyltoluene	99-87-6	8/68	11.76471	0.050 - 0.050	0.12	2	7AZP-2	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain toxicity
n-Propylbenzene	103-65-1	4/68	5.882353	0.050 - 0.25	0.11	1	7AZP-2	- -	2.10E+04	2100	240	No	maximum reported concentration less than screening level
Tetrachloroethene	127-18-4	20/68	29.41176	0.050 - 0.050	0.59	8.6	7AZP-2	1.10E+02	4.10E+02	41	13	No	maximum reported concentration less than screening level
Toluene	108-88-3	1/68	1.470588	0.050 - 0.050	0.07	0.07	7AZP-3	- -	4.50E+04	4500	650	No	frequency of reporting < 5%; maximum reported concentration less than screening level
Trichloroethene	79-01-6	2/68	2.941176	0.050 - 0.050	0.054	0.088	7AZP-4	6.40E+00	2.00E+01	2	65	No	frequency of reporting < 5%; maximum reported concentration less than screening level
1,2,4-Trimethylbenzene	95-63-6	9/68	13.23529	0.050 - 0.050	0.14	6.9	7AZP-2	- -	2.60E+02	26	170	No	maximum reported concentration less than screening level
1,3,5-Trimethylbenzene	108-67-8	8/68	11.76471	0.050 - 0.10	0.25	2.6	7AZP-2	- -	1.00E+04	1000	70	No	maximum reported concentration less than screening level
Xylenes (total)	1330-20-7	1/68	1.470588	0.20 - 0.20	0.74	0.74	7AZP-3	- -	2.70E+03	270	420	No	maximum reported concentration less than screening level

Notes:

Concentrations reported in milligrams per kilogram (mg/kg)
RSL = US EPA Regional Screening Level
AZ SRL = Arizona Soil Remediation Level (non-residential)
- - = not available
= Identified chemical of potential concern (COPC)

Analyte	CAS No.	Frequency		%	Range of Reporting Limits	Reported Concentrations		Location of Maximum	Ambient Air RSL		Basis	Screening Level	COPC	Rationale
		No. of Detects	No. of Samples			Minimum	Maximum		Cancer	Non-cancer				
Acetone	67-64-1	9	117	7.69	23.8 - 236000	50	16600	YC-5	- -	3.20E+04	RfC	3200	No	frequency of reporting > 5%; has not been reported in recent sampling rounds above the screening level with acceptable reporting limits
Benzene	71-43-2	27	186	14.52	3.19 - 31800	3.51	16300	YC-4	3.10E-01	3.10E+01	IUR	0.31	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
Bromodichloromethane	75-27-4	2	117	1.71	3.3 - 66800	22.4	174	7AZ-P8-30	6.60E-02	- -	IUR	0.066	No	frequency of reporting < 5%; isolated occurences at disparite locations, not likely site-related
1,3-Butadiene	106-99-0	2	12	16.67	5.53 - 1110	25.6	36	SG-4-5	8.10E-02	2.10E+00	IUR	0.081	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
2-Butanone (MEK)	78-93-3	20	117	17.09	2.9 - 58700	12.1	12600	SG-6-5	- -	5.20E+03	RfC	520	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
sec-Butylbenzene	135-98-8	1	32	3.13	11 - 27500	1540	1540	MW-PD-12	- -	- -	- -	- -	Yes	frequency of reporting < 5%; uncertain toxicity
Carbon disufide	75-15-0	7	117	5.98	3.11 - 31000	2.5	56	7AZ-P8-45	- -	7.30E+02	RfC	73	No	maximum reported concentration less than screening level
Chloroform	67-66-3	63	180	35.00	2.4 - 48600	14.2	43000	7AZ-P4-45	1.10E-01	1.00E+02	IUR	0.11	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
Chloromethane	74-87-3	1	180	0.56	1.0 - 20600	19.9	19.9	MW-PD-5	- -	9.40E+01	RfC	9.4	No	frequency of reporting << 5%
Cyclohexane	110-82-7	4	117	3.42	3.44 - 34300	11	413	MW-PD-14	- -	6.30E+03	RfC	630	No	frequency of reporting < 5%; maximum reported concentration less than screening level
Dibromochloromethane	124-48-1	1	117	0.85	4.26 - 85100	128	128	7AZ-P8-30	9.00E-02	- -	IUR	0.09	No	frequency of reporting << 5%; has not been reported in recent sampling rounds with acceptable reporting limits
1,2-Dichlorobenzene	95-50-1	5	180	2.78	3.0 - 60100	68	320	7AZ-P4-30	- -	2.10E+02	RfC	21	No	frequency of reporting < 5%
1,3-Dichlorobenzene	541-73-1	7	180	3.89	3.0 - 60100	84	850	7AZ-P4-15	- -	- -	- -	- -	Yes	uncertain toxicity
1,4-Dichlorobenzene	106-46-7	11	180	6.11	3.0 - 59800	6.01	720	7AZ-P4-15	2.20E-01	8.30E+02	IUR	0.22	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
Dichlorodifluoromethane (Freon 12)	75-71-8	5	180	2.78	2.48 - 49200	2.9	99	MW-PD-5	- -	1.00E+02	RfC	10	No	frequency of reporting < 5%; isolated occurences at disparite locations, not likely site-related
1,1-Dichloroethane	75-34-3	14	186	7.53	2.02 - 40500	36	350	7AZ-P4	1.50E+00	- -	IUR	1.5	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
cis-1,2-Dichloroethene	156-59-2	94	186	50.54	2.0 - 39500	95	874000	7AZ-P4	- -	- -	- -	- -	Yes	frequency of detection >> 5%; uncertain inhalation toxicity
trans-1,2-Dichloroethene	156-60-5	19	123	15.45	2.0 - 39500	329	55300	7AZ-P4	- -	6.30E+01	RfC	6.3	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
Ethyl acetate	141-78-6	1	117	0.85	3.6 - 36000	8.64	8.64	7AZ-P8-15	- -	- -	- -	- -	Yes	uncertain inhalation toxicity
Ethylbenzene	100-41-4	9	186	4.84	4.34 - 43200	5.64	24300	YC-4	9.70E-01	1.00E+03	IUR	0.97	Yes	minimum reported concentration exceeds screening level; reporting limits elevated in many samples
4-Ethyltoluene	622-96-8	11	117	9.40	9.84 - 48900	5.9	182000	YC-4	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain toxicity
Heptane	142-82-5	8	117	6.84	4.1 - 40800	12.3	57300	YC-4	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain toxicity
Hexane	110-54-3	9	117	7.69	3.52 - 35100	6.69	49300	YC-4	- -	7.30E+02	RfC	73	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
Isopropylbenzene (Cumene)	98-82-8	2	32	6.25	9.84 - 24600	10.3	2410	MW-PD-12	- -	4.20E+02	RfC	42	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
Methylcyclohexane	108-87-2	4	32	12.50	8.04 - 20100	52.3	64300	MW-PD-15	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain toxicity
Methyl *tert*-butyl ether	1634-04-4	3	117	2.56	3.6 - 72100	1120	396000	YC-4	9.40E+00	3.10E+03	IUR	9.4	Yes	minimum reported concentration exceeds screening level
Naphthalene	91-20-3	1	32	3.13	21 - 52400	34.6	34.6	MW-PD-13	7.20E-02	3.10E+00	IUR	0.072	No	frequency of reporting < 5%; reported concentration is isolated occurance away from source area
Nonane	111-84-2	3	32	9.38	10.5 - 26200	14.7	8910	MW-PD-12	- -	2.10E+02	RfC	21	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
Octane	111-65-9	2	32	6.25	9.34 - 23400	46.7	4440	MW-PD-12	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain toxicity
2-Propanol (Isopropyl alcohol)	67-63-0	4	98	4.08	4.9 - 97900	250	10000	MW-PD-14	- -	7.30E+03	RfC	730	Yes	maximum reported concentration exceeds screening level; reporting limits elevated in recent samples
Propene	115-07-1	14	98	14.29	1.72 - 17100	20.6	1200	7AZ-P2-30	- -	3.10E+03	RfC	310	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
n-Propylbenzene	103-65-1	1	32	3.13	9.84 - 24600	2020	2020	MW-PD-12	- -	1.00E+03	RfC	100	No	frequency of reporting < 5%; reported concentration from location upgradient of site
Styrene	100-42-5	1	159	0.63	2 - 42400	11900	11900	7AZP-2	- -	1.00E+03	RfC	100	No	frequency of reporting << 5%; has not been reported in recent sampling rounds with acceptable reporting limits
1,1,2,2-Tetrachloroethane	79-34-5	1	180	0.56	3.43 - 68600	99	99	7AZ-P1	4.20E-02	- -	IUR	0.042	No	frequency of reporting << 5%; has not been reported in recent sampling rounds with acceptable reporting limits
Tetrachloroethene	127-18-4	183	186	98.39	67.8 - 17000	10.2	14000000	7AZ-P2-45	9.40E+00	4.20E+01	RfC	4.2	Yes	frequency of reporting >> 5%; minimum reported concentration exceeds screening level
Tetrahydrofuran	109-99-9	15	117	12.82	5.9 - 117000	41.3	9432	7AZ-P1-45	- -	2.10E+03	RfC	210	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
Toluene	108-88-3	32	186	17.20	3.77 - 37500	18.1	135583	YC-4	- -	5.20E+03	RfC	520	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
1,2,4-Trichlorobenzene	120-82-1	1	150	0.67	14.8 - 297000	22000	22000	7AZ-P4-15	- -	2.10E+00	RfC	0.21	No	frequency of reporting << 5%; has not been reported in recent sampling with acceptable reporting limits
Trichloroethene	79-01-6	140	186	75.27	2.7 - 13400	10.7	4360000	7AZ-P4	4.30E-01	2.10E+00	RfC	0.21	Yes	frequency of reporting >> 5%; minimum reported concentration exceeds screening level
Trichlorofluoromethane	75-69-4	1	180	0.56	2.8 - 55900	6.41	6.41	7AZ-P12	- -	7.30E+02	RfC	73	No	frequency of reporting << 5%; maximum reported concentration less than screening level; isolated occurence at one location removed from source area, not likely site-related
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	2	162	1.23	3.83 - 76600	110	180	7AZ-P1	- -	3.10E+04	RfC	3100	No	frequency of reporting < 5%; maximum reported concentration less than screening level
1,2,4-Trimethylbenzene	95-63-6	45	180	25.00	4.92 - 48900	6.4	324000	YC-4	- -	7.30E+00	RfC	0.73	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
1,3,5-Trimethylbenzene	108-67-8	30	180	16.67	4.92 - 48900	5.4	162000	YC-4	- -	- -	- -	- -	Yes	frequency of detection > 5%; uncertain inhalation toxicity
2,2,4-Trimethylpentane	540-84-1	21	117	17.95	4.66 - 46500	19.1	1630000	MW-PD-16	- -	- -	- -	- -	Yes	frequency of detection > 5%; uncertain toxicity
Vinyl chloride	75-01-4	6	186	3.23	1.28 - 25600	15	120	7AZ-P1	1.60E-01	1.00E+02	IUR	0.16	Yes	minimum reported concentration exceeds screening level; reporting limits at detected locations elevated in subsequent sampling
m-Xylene	108-38-3	26	186	13.98	8.68 - 86400	13.5	56400	7AZ-P4	- -	1.00E+02	RfC	10	Yes	frequency of reporting > 5%; minimum reported concentration exceeds screening level
o-Xylene	95-47-6	26	186	13.98	4.34 - 43200	6.08	1300000	YC-4	- -	1.00E+02	RfC	10	Yes	frequency of reporting > 5%; maximum reported concentration exceeds screening level
p-Xylene	106-42-3			(1)	(1)	(1)	(1)	(1)	- -	1.00E+02	RfC	10	Yes	see *m*-xylene

Notes:

Concentrations reported in micrograms per cubic meter (µg/m^3)
- - = not available
Basis: RfC = noncancer reference concentration; IUR = cancer inhalation unit risk
(1) coeluting compound; results reported with m-xylene
= Identified chemical of potential concern (COPC)

Analyte	CAS No.	Frequency	%	Range of Reporting Limits	Reported Concentrations (µg/L)		Location of Maximum	H	Vapor concentrations (µg/m^3)		Ambient Air RSL		Basis	Screening Level	COPC	Rationale
					Minimum	Maximum		(atm-m^3/mole)	Minimum	Maximum	Cancer	Non-cancer				
Acetone	67-64-1	3/273	1.1	10 - 2500	13	430	MW-PD-15	3.50E-05	1.86E+01	6.15E+02	- -	3.20E+04	RfC	3.20E+03	No	frequency of reporting < 5%; maximum reported concentration less than screening level
Acrolein	107-02-8	1/76	1.3	50 - 2500	520	520	BF-3	1.22E-04	2.59E+03	2.59E+03	- -	2.10E-02	RfC	2.10E-03	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but isolated occurrence
Benzene	71-43-2	24/273	8.8	0.5 - 25	0.5	2.9	7AZP-4	5.55E-03	1.13E+02	6.58E+02	3.10E-01	3.10E+01	IUR	3.10E-01	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
2-Butanone (MEK)	78-93-3	5/273	1.8	2.5 - 500	3.6	270	BF-1	5.69E-05	8.37E+00	6.28E+02	- -	5.20E+03	RfC	5.20E+02	No	frequency of reporting < 5%; maximum reported concentration exceeds screening level but isolated occurrences
n-Butylbenzene	104-51-8	30/273	11.0	0.5 - 50	0.5	13	MW-PD-4	1.59E-02	3.25E+02	8.45E+03	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain inhalation toxicity
sec-Butylbenzene	135-98-8	44/273	16.1	0.5 - 50	0.5	10	MW-PD-15	1.38E-02	2.82E+02	5.64E+03	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain inhalation toxicity
tert-Butylbenzene	98-06-6	2/232	0.9	0.5 - 50	0.6	1	7AZP-3	1.32E-02	3.24E+02	5.40E+02	- -	- -	- -	- -	Yes	frequency of reporting << 5%; uncertain inhalation toxicity
Carbon disufide	75-15-0	1/80	1.3	0.5 - 20	5.2	5.2	YC-5	1.44E-02	3.06E+03	3.06E+03	- -	7.30E+02	RfC	7.30E+01	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but isolated occurrence
Chloroform	67-66-3	9/273	3.3	0.5 - 250	0.5	3.7	7AZP-4	3.67E-03	7.50E+01	5.55E+02	1.10E-01	1.00E+02	IUR	1.10E-01	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but isolated occurrences
Chloromethane	74-87-3	1/273	0.4	0.5 - 50	1	1	MW-PD-15	8.82E-03	3.60E+02	3.60E+02	- -	9.40E+01	RfC	9.40E+00	No	frequency of reporting << 5%; minimim reported concentration exceeds screening level, but not reported in recent samples with acceptable reporting limits
1,2-Dichloroethane	107-06-2	13/273	4.8	0.5 - 50	0.6	14	MW-PD-5	1.18E-03	2.89E+01	6.75E+02	9.40E-02	7.30E+00	IUR	9.40E-02	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but only present upgradient of source property
1,1-Dichoroethene	75-35-4	7/273	2.6	0.5 - 50	0.6	1.6	MW-PD-14	2.61E-02	6.40E+02	1.71E+03	- -	2.10E+02	RfC	2.10E+01	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but not reported in recent samples with acceptable reporting limits
cis-1,2-Dichloroethene	156-59-2	150/273	54.9	0.5 - 5	0.5	1700	MW-PD-14	4.08E-03	8.34E+01	2.83E+05	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain inhalation toxicity
trans-1,2-Dichloroethene	156-60-5	120/273	44.0	0.5 - 25	0.6	510	MW-PD-14	4.08E-03	1.00E+02	8.50E+04	- -	6.30E+01	RfC	6.30E+00	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
1,3- Dichloropropane	142-28-9	1/273	0.4	0.5 - 50	1.1	1.1	MW-PD-30	9.76E-04	4.39E+01	4.39E+01	- -	- -	- -	- -	Yes	frequency of reporting << 5%; uncertain inhalation toxicity
Ethylbenzene	100-41-4	12/273	4.4	0.5 - 50	0.5	5.1	MW-PD-13	7.88E-03	1.61E+02	1.64E+03	9.70E-01	1.00E+03	IUR	9.70E-01	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but isolated occurrences commonly associated with LNAPL
2-Hexanone	591-78-6	2/145	1.4	1 - 20	2.6	9.2	MW-PD-5	9.32E-05	9.90E+00	3.50E+01	- -	3.10E+01	RfC	3.10E+00	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but not reported in recent samples with acceptable reporting limits
Isopropylbenzene (Cumene)	98-82-8	17/156	10.9	0.5 - 50	0.5	16	MW-PD-15	1.15E-02	2.35E+02	7.52E+03	- -	4.20E+02	RfC	4.20E+01	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
p-Isopropyltoluene	99-87-6	22/273	8.1	0.5 - 50	0.5	3.6	7AZP-4	7.90E-03	1.61E+02	1.16E+03	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain inhalation toxicity
Methyl *tert*-butyl ether	1634-04-4	81/273	29.7	0.5 - 25	0.6	570	MW-PD-31	5.87E-04	1.44E+01	1.37E+04	9.40E+00	3.10E+03	IUR	9.40E+00	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
Methylene chloride	75-09-2	7/273	2.6	1 - 250	0.6	18	MW-PD-4	3.25E-03	7.97E+01	2.39E+03	9.60E+01	6.30E+02	RfC	6.30E+01	No	frequency of reporting < 5%; minimim reported concentration exceeds screening level, but not reported in recent samples with acceptable reporting limits
Naphthalene	91-20-3	45/156	28.8	2 - 250	3.2	150	MW-PD-4	4.40E-04	5.75E+01	2.70E+03	7.20E-02	3.10E+00	IUR	7.20E-02	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
n-Propylbenzene	103-65-1	34/273	12.5	0.5 - 50	0.7	15	MW-PD-15	1.05E-02	3.00E+02	6.44E+03	- -	1.00E+03	RfC	1.00E+02	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
Tetrachloroethene	127-18-4	209/273	76.6	0.5 - 5	0.5	840	MW-PD-14	1.77E-02	3.62E+02	6.08E+05	9.40E+00	4.20E+01	RfC	4.20E+00	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
Toluene	108-88-3	9/273	3.3	0.5 - 250	0.5	62	7AZP-4	6.64E-03	1.36E+02	1.68E+04	- -	5.20E+03	RfC	5.20E+02	No	frequency of reporting < 5%; maximum reported concentration less than screening level
1,1,2-Trichloroethane	79-00-5	1/273	0.4	0.5 - 50	8.7	8.7	MW-PD-14	8.24E-04	2.93E+02	2.93E+02	1.50E-01	2.10E-01	RfC	2.10E-02	No	frequency of reporting << 5%; minimim reported concentration exceeds screening level, but not reported in recent samples with acceptable reporting limits
Trichloroethene	79-01-6	180/273	65.9	0.5 - 1	0.5	300	7AZP-4	9.85E-03	2.01E+02	1.21E+05	4.30E-01	2.10E+00	RfC	2.10E-01	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
1,2,4-Trimethylbenzene	95-63-6	63/273	23.1	0.5 - 50	0.6	61	MW-PD-6	6.16E-03	1.51E+02	1.54E+04	- -	7.30E+00	RfC	7.30E-01	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level
1,3,5-Trimethylbenzene	108-67-8	39/273	14.3	0.5 - 50	0.5	12	MW-PD-6	8.77E-03	1.79E+02	4.30E+03	- -	- -	- -	- -	Yes	frequency of reporting > 5%; uncertain inhalation toxicity
Xylenes (total)	1330-20-7	15/273	5.5	0.5 - 150	0.6	13	MW-PD-6	5.18E-03	1.27E+02	2.75E+03	- -	1.00E+02	RfC	1.00E+01	Yes	frequency of reporting > 5%; minimim reported concentration exceeds screening level

Notes:
H = Henry's law constant
µg/L = micrograms per liter
µg/m^3 = micrograms per cubic meter
RSL = Regional Screening Level (µg/m^3)
Basis: RfC = noncancer reference concentration; IUR = cancer inhalation unit risk
- - = not available
[shaded] = Identified chemical of potential concern (COPC)

TABLE B.5
Soil Parameter Values

Parameter	Symbol	Value	Units
Total porosity	θ	0.32	cm^3/cm^3
Volumetric moisture content	θ_w	0.09	cm^3/cm^3
Air-filled porosity	θ_a	0.23	cm^3/cm^3
Gas permeability	k_v	$3x10^{-8}$	cm^2

Notes:
cm^3 = cubic centimeter
cm^2 = square centimeter

TABLE B.6
Building-related Parameter Values

Parameter	Symbol	Value	Units
Enclosed space floor thickness	L_{crack}	15	cm
Soil-bldg pressure differential	ΔP	40	$g/cm\text{-}s^2$
Enclosed space floor length	L_B	1000	cm
Enclosed space floor width	W_B	1000	cm
Enclosed space height (slab-on-grade)	H_B	244	cm
Enclosed space height (basement)	H_B	366	cm
Floor-wall seam crack width	w	0.1	cm
Indoor air exchange rate	ER	0.25	1/h

Notes:
cm = centimeter
h = hour
$g/cm\text{-}s^2$ = grams per centimeter per second squared

TABLE B.7
Residential Exposure at 7AZP-6

Analyte	CAS No.	Groundwater Concentration (µg/L)	H (atm-m^3/mol)	Soil Vapor Concentration (µg/m^3)	Indoor Air Concentration (µg/m^3)	Exposure Concentration (µg/m^3)	
						Cancer	Non-Cancer
Slab-on-grade							
Tetrachloroethene	127-18-4	NA	NA	17600	2.55E+00	1.05E+00	2.45E+00
Trichloroethene	79-01-6	NA	NA	1770	2.79E-01	1.15E-01	2.68E-01
cis-1,2-Dichloroethene	156-59-2	0.74	4.08E-03	123	1.82E-02	7.47E-03	1.74E-02
Methyl *tert*-butyl ether	1634-04-4	0.69	5.87E-04	16.6	2.45E-02	1.01E-02	2.35E-02
Basement							
Tetrachloroethene	127-18-4	NA	NA	17600	2.92E+00	1.20E+00	2.80E+00
Trichloroethene	79-01-6	NA	NA	1770	3.16E-01	1.30E-01	3.03E-01
cis-1,2-Dichloroethene	156-59-2	0.74	4.08E-03	123	2.07E-02	8.53E-03	1.99E-02
Methyl *tert*-butyl ether	1634-04-4	0.69	5.87E-04	16.6	2.67E-02	1.10E-02	2.56E-02

Notes:

H = Henry's law constant

µg/L = micrograms per liter

µg/m^3 = micrograms per cubic meter

atm-m^3/mol = atmospheres per cubic meter per mole

TABLE B.8
Residential Exposure at MW-PD-6

Analyte	CAS No.	Soil Vapor Concentration ($\mu g/m^3$)	Indoor Air Concentration ($\mu g/m^3$)	Exposure Concentration ($\mu g/m^3$)	
				Cancer	Non-Cancer
Slab-on-grade					
Tetrachloroethene	127-18-4	51700	8.32E+00	3.42E+00	7.98E+00
Basement					
Tetrachloroethene	127-18-4	51700	9.47E+00	3.89E+00	9.08E+00

Notes:
$\mu g/m^3$ = micrograms per cubic meter

TABLE B.9
Commercial Worker Exposure Adjacent to Source Property

Analyte	CAS No.	Location ID	Year	Depth (feet)	Soil Vapor Concentration (µg/m^3)	Attenuation Factor	Indoor Air Concentration (µg/m^3)	Exposure Concentration (µg/m^3)	
								Cancer	Non-Cancer
Slab-on-grade									
Tetrachloroethene	127-18-4	SG-9-4	2013	4	82700	3.00E-02	2.48E+03	2.02E+02	5.66E+02
Trichloroethene	79-01-6	SG-5-5	2013	5	1890	3.00E-02	5.67E+01	4.62E+00	1.29E+01
cis-1,2-Dichloroethene	156-59-2	SG-5-5	2013	5	207	3.00E-02	6.21E+00	5.06E-01	1.42E+00
trans-1,2-Dichloroethene	156-60-5	MW-PD-14	2011	52	5540	1.75E-04	9.69E-01	7.90E-02	2.21E-01
Benzene	71-43-2	SG-3-5	2013	5	38.9	3.00E-02	1.17E+00	9.52E-02	2.66E-01
1,3-Butadiene	106-99-0	SG-4-5	2013	5	36	3.00E-02	1.08E+00	8.81E-02	2.47E-01
2-Butanone (MEK)	78-93-3	SG-1-5	2013	5	44.7	3.00E-02	1.34E+00	1.09E-01	3.06E-01
Chloroform	67-66-3	MW-PD-29	2012	59	69.3	2.20E-04	1.52E-02	1.24E-03	3.48E-03
Cyclohexane	110-82-7	MW-PD-14	2011	52	413	1.95E-04	8.06E-02	6.57E-03	1.84E-02
Ethylbenzene	100-41-4	SG-1-5	2013	5	135	3.00E-02	4.05E+00	3.30E-01	9.25E-01
Hexane	110-54-3	SG-4-5	2013	5	22.2	3.00E-02	6.66E-01	5.43E-02	1.52E-01
Nonane	111-84-2	SG-1-5	2013	5	89.6	3.00E-02	2.69E+00	2.19E-01	6.14E-01
Octane	111-65-9	SG-1-5	2013	5	46.7	3.00E-02	1.40E+00	1.14E-01	3.20E-01
Propene	115-07-1	SG-3-5	2013	5	329	3.00E-02	9.87E+00	8.05E-01	2.25E+00
Tetrahydrofuran	109-99-9	7AZ-P8-15	2011	15	41.3	6.07E-04	2.51E-02	2.04E-03	5.72E-03
Toluene	108-88-3	SG-1-5	2013	5	123	3.00E-02	3.69E+00	3.01E-01	8.42E-01
1,2,4-Trimethylbenzene	95-63-6	7AZ-P2	2011	58.7	4920	1.36E-04	6.69E-01	5.45E-02	1.53E-01
1,3,5-Trimethylbenzene	108-67-8	7AZ-P2	2011	58.7	2900	1.35E-04	3.92E-01	3.19E-02	8.95E-02
2,2,4-Trimethylpentane	540-84-1	7AZ-P8-30	2011	30	60.6	2.38E-04	1.44E-02	1.18E-03	3.29E-03
Vinyl chloride	75-01-4	7AZ-P1	2002	60	120	2.20E-04	2.64E-02	2.16E-03	6.03E-03
Xylenes	1330-20-7	SG-1-5	2013	5	475	3.00E-02	1.43E+01	1.16E+00	3.25E+00

TABLE B.9
Commercial Worker Exposure Adjacent to Source Property

Analyte	CAS No.	Location ID	Year	Depth (feet)	Soil Vapor Concentration (µg/m³)	Attenuation Factor	Indoor Air Concentration (µg/m³)	Exposure Concentration (µg/m³)	
								Cancer	Non-Cancer
Basement									
Tetrachloroethene	127-18-4	SG-9-4	2013	4	82700	3.00E-02	2.48E+03	2.02E+02	5.66E+02
Trichloroethene	79-01-6	SG-5-5	2013	5	1890	3.00E-02	5.67E+01	4.62E+00	1.29E+01
cis-1,2-Dichloroethene	156-59-2	SG-5-5	2013	5	207	3.00E-02	6.21E+00	5.06E-01	1.42E+00
trans-1,2-Dichloroethene	156-60-5	MW-PD-14	2011	52	5540	1.98E-04	1.10E+00	8.96E-02	2.51E-01
Benzene	71-43-2	SG-3-5	2013	5	38.9	3.00E-02	1.17E+00	9.52E-02	2.66E-01
1,3-Butadiene	106-99-0	SG-4-5	2013	5	36	3.00E-02	1.08E+00	8.81E-02	2.47E-01
2-Butanone (MEK)	78-93-3	SG-1-5	2013	5	44.7	3.00E-02	1.34E+00	1.09E-01	3.06E-01
Chloroform	67-66-3	MW-PD-29	2012	59	69.3	2.37E-04	1.64E-02	1.34E-03	3.75E-03
Cyclohexane	110-82-7	MW-PD-14	2011	52	413	2.17E-04	8.98E-02	7.32E-03	2.05E-02
Ethylbenzene	100-41-4	SG-1-5	2013	5	135	3.00E-02	4.05E+00	3.30E-01	9.25E-01
Hexane	110-54-3	SG-4-5	2013	5	22.2	3.00E-02	6.66E-01	5.43E-02	1.52E-01
Nonane	111-84-2	SG-1-5	2013	5	89.6	3.00E-02	2.69E+00	2.19E-01	6.14E-01
Octane	111-65-9	SG-1-5	2013	5	46.7	3.00E-02	1.40E+00	1.14E-01	3.20E-01
Propene	115-07-1	SG-3-5	2013	5	329	3.00E-02	9.87E+00	8.05E-01	2.25E+00
Tetrahydrofuran	109-99-9	7AZ-P8-15	2011	15	41.3	5.63E-04	2.32E-02	1.89E-03	5.31E-03
Toluene	108-88-3	SG-1-5	2013	5	123	3.00E-02	3.69E+00	3.01E-01	8.42E-01
1,2,4-Trimethylbenzene	95-63-6	7AZ-P2	2011	58.7	4920	1.58E-04	7.79E-01	6.35E-02	1.78E-01
1,3,5-Trimethylbenzene	108-67-8	7AZ-P2	2011	58.7	2900	1.57E-04	4.56E-01	3.72E-02	1.04E-01
2,2,4-Trimethylpentane	540-84-1	7AZ-P8-30	2011	30	60.6	2.73E-04	1.66E-02	1.35E-03	3.78E-03
Vinyl chloride	75-01-4	7AZ-P1	2002	60	120	2.37E-04	2.84E-02	2.32E-03	6.49E-03
Xylenes	1330-20-7	SG-1-5	2013	5	475	3.00E-02	1.43E+01	1.16E+00	3.25E+00

Notes:
µg/m³ = micrograms per cubic meter

TABLE B.10
Commercial Worker Exposure at YC-6

Analyte	CAS No.	Soil Vapor Concentration ($\mu g/m^3$)	Indoor Air Concentration ($\mu g/m^3$)	Exposure Concentration ($\mu g/m^3$) Cancer	Exposure Concentration ($\mu g/m^3$) Non-Cancer
Slab-on-grade					
Tetrachloroethene	127-18-4	278	4.70E-02	3.83E-03	1.07E-02
Trichloroethene	79-01-6	10.7	1.96E-03	1.60E-04	4.49E-04
Benzene	71-43-2	4.79	9.68E-04	7.89E-05	2.21E-04
2-Butanone (MEK)	78-93-3	295	5.54E-02	4.52E-03	1.26E-02
1,4-Dichlorobenzene	106-46-7	6.01	9.77E-04	7.97E-05	2.23E-04
Heptane	142-82-5	20.1	3.09E-03	2.52E-04	7.06E-04
Hexane	110-54-3	21.5	8.60E-03	7.01E-04	1.96E-03
Methylcyclohexane	108-87-2	52.3	9.00E-03	7.34E-04	2.05E-03
Tetrahydrofuran	109-99-9	127	2.76E-02	2.25E-03	6.30E-03
Toluene	108-88-3	24.9	4.98E-03	4.06E-04	1.14E-03
1,2,4-Trimethylbenzene	95-63-6	6.4	9.24E-04	7.54E-05	2.11E-04
2,2,4-Trimethylpentane	540-84-1	36.3	4.99E-03	4.07E-04	1.14E-03
Xylenes (total)	1330-20-7	13.5	2.22E-03	1.81E-04	5.08E-04
Basement					
Tetrachloroethene	127-18-4	278	5.33E-02	4.35E-03	1.22E-02
Trichloroethene	79-01-6	10.7	2.20E-03	1.79E-04	5.02E-04
Benzene	71-43-2	4.79	1.07E-03	8.69E-05	2.43E-04
2-Butanone (MEK)	78-93-3	295	6.18E-02	5.04E-03	1.41E-02
1,4-Dichlorobenzene	106-46-7	6.01	1.12E-03	9.10E-05	2.55E-04
Heptane	142-82-5	20.1	3.56E-03	2.90E-04	8.13E-04
Hexane	110-54-3	21.5	8.01E-03	6.53E-04	1.83E-03
Methylcyclohexane	108-87-2	52.3	1.02E-02	8.31E-04	2.33E-03
Tetrahydrofuran	109-99-9	127	3.00E-02	2.44E-03	6.84E-03
Toluene	108-88-3	24.9	5.49E-03	4.48E-04	1.25E-03
1,2,4-Trimethylbenzene	95-63-6	6.4	1.07E-03	8.76E-05	2.45E-04
2,2,4-Trimethylpentane	540-84-1	36.3	5.83E-03	4.76E-04	1.33E-03
Xylenes (total)	1330-20-7	13.5	2.53E-03	2.07E-04	5.78E-04

Notes:

$\mu g/m^3$ = micrograms per cubic meter

TABLE B.11
Commercial Worker Exposure at MW-PD-1

Analyte	CAS No.	Groundwater Concentration (µg/L)	H (atm-m^3/mol)	Soil Vapor Concentration (µg/m^3)	Indoor Air Concentration (µg/m^3)	Exposure Concentration (µg/m^3)	
						Cancer	Non-Cancer
Slab-on-grade							
Tetrachloroethene	127-18-4	NA	NA	8140	1.51E+00	1.23E-01	3.45E-01
Trichloroethene	79-01-6	NA	NA	913	1.84E-01	1.50E-02	4.21E-02
cis-1,2-Dichloroethene	156-59-2	NA	NA	1700	3.22E-01	2.63E-02	7.35E-02
trans-1,2-Dichloroethene	156-60-5	NA	NA	594.0	1.09E-01	8.85E-03	2.48E-02
Methyl *tert*-butyl ether	1634-04-4	2.3	5.87E-04	55.2	1.40E-02	1.14E-03	3.19E-03
Toluene	108-88-3	NA	NA	86.7	1.90E-02	1.55E-03	4.35E-03
Basement							
Tetrachloroethene	127-18-4	NA	NA	8140	1.71E+00	1.39E-01	3.90E-01
Trichloroethene	79-01-6	NA	NA	913	2.05E-01	1.67E-02	4.68E-02
cis-1,2-Dichloroethene	156-59-2	NA	NA	1700	3.62E-01	2.96E-02	8.27E-02
trans-1,2-Dichloroethene	156-60-5	NA	NA	594.0	1.23E-01	1.00E-02	2.81E-02
Methyl *tert*-butyl ether	1634-04-4	2.3	5.87E-04	55.2	1.48E-02	1.21E-03	3.38E-03
Toluene	108-88-3	NA	NA	86.7	2.08E-02	1.70E-03	4.76E-03

Notes:
H = Henry's law constant
µg/L = micrograms per liter
µg/m^3 = micrograms per cubic meter
atm-m^3/mol = atmospheres per cubic meter per mole

TABLE B.12
Passer-By Exposure at Source Property

Analyte	CAS No.	Soil Vapor Concentration (µg/m³)	Location	Depth (m)	D_E (m^2/s)	Flux (µg/m^2 s)	Outdoor Air Concentration (µg/m³)	Exposure Concentration (µg/m³)	
								Cancer	Non-Cancer
Tetrachloroethene	127-18-4	499000	SG-6-5	1.52	3.67E-07	1.21E-01	9.92E-01	2.53E-03	7.07E-03
Trichloroethene	79-01-6	16900	SG-6-5	1.52	5.00E-07	5.56E-03	4.57E-02	1.16E-04	3.26E-04
cis-1,2-Dichloroethene	156-59-2	207	SG-5-5	1.52	6.44E-07	8.77E-05	7.21E-04	1.84E-06	5.14E-06
trans-1,2-Dichloroethene	156-60-5	475	7AZP-3	18.29	6.38E-07	1.66E-05	1.36E-04	3.47E-07	9.72E-07
Benzene	71-43-2	38.9	SG-3-5	1.52	6.52E-07	1.67E-05	1.37E-04	3.49E-07	9.78E-07
1,3-Butadiene	106-99-0	36	SG-4-5	1.52	7.31E-07	1.73E-05	1.42E-04	3.62E-07	1.01E-06
2-Butanone	78-93-3	12600	SG-6-5	1.52	6.67E-07	5.53E-03	4.55E-02	1.16E-04	3.24E-04
Chloroform	67-66-3	781	7AZP-4-30	9.14	5.60E-07	4.79E-05	3.93E-04	1.00E-06	2.81E-06
Ethylbenzene	100-41-4	135	SG-1-5	1.52	4.99E-07	4.43E-05	3.64E-04	9.28E-07	2.60E-06
Hexane	110-54-3	22.2	SG-4-5	1.52	5.32E-07	7.77E-06	6.39E-05	1.63E-07	4.56E-07
Nonane	111-84-2	89.6	SG-1-5	1.52	3.74E-07	2.21E-05	1.81E-04	4.62E-07	1.29E-06
Octane	111-65-9	46.7	SG-1-5	1.52	- -	- -	- -	- -	- -
Propene	115-07-1	358	SG-7-4	1.22	8.01E-07	2.35E-04	1.93E-03	4.92E-06	1.38E-05
Toluene	108-88-3	123	SG-1-5	1.52	5.66E-07	4.58E-05	3.77E-04	9.60E-07	2.69E-06
1,2,4-Trimethylbenzene	95-63-6	4920	7AZP-2	17.89	4.42E-07	1.21E-04	9.99E-04	2.54E-06	7.13E-06
1,3,5-Trimethylbenzene	108-67-8	2900	7AZP-2	17.89	4.38E-07	7.11E-05	5.84E-04	1.49E-06	4.17E-06
Vinyl chloride	75-01-4	120	7AZP-1	18.29	7.80E-07	5.12E-06	4.21E-05	1.07E-07	3.00E-07
Xylenes	1330-20-7	475	SG-1-5	1.52	6.17E-07	1.93E-04	1.58E-03	4.04E-06	1.13E-05

Notes:

µg/m^2-s = micrograms per square meter per second

µg/m^3 = micrograms per cubic meter

D_E = effective diffusion coefficient

m = meter

m^2/s = meter squared per second

TABLE B.13
Utility Worker Acute Exposure at Source Property

Analyte	CAS No.	Soil Vapor Concentration (µg/m^3)	Location	Depth (m)	D_E (m^2/s)	Flux (µg/m^2 s)	Trench Air Concentration (µg/m^3)	Exposure Concentration (µg/m^3)	
								Cancer	Non-Cancer
Tetrachloroethene	127-18-4	82700	SG-6-5'	1	3.67E-07	3.04E-02	1.09E+02	4.99E-03	1.09E+02
Trichloroethene	79-01-6	1890	SG-6-5'	1	5.00E-07	9.45E-04	3.40E+00	1.55E-04	3.40E+00
cis-1,2-Dichloroethene	156-59-2	207	SG-5-5'	1	6.44E-07	1.33E-04	4.80E-01	2.19E-05	4.80E-01
Benzene	71-43-2	38.9	SG-3-5'	1	6.52E-07	2.54E-05	9.13E-02	4.17E-06	9.13E-02
1,3-Butadiene	106-99-0	36	SG-4-5'	1	7.31E-07	2.63E-05	9.47E-02	4.32E-06	9.47E-02
2-Butanone	78-93-3	44.7	SG-6-5'	1	6.67E-07	2.98E-05	1.07E-01	4.90E-06	1.07E-01
Ethylbenzene	100-41-4	135	SG-1-5'	1	4.99E-07	6.73E-05	2.42E-01	1.11E-05	2.42E-01
Hexane	110-54-3	22.2	SG-4-5'	1	5.32E-07	1.18E-05	4.25E-02	1.94E-06	4.25E-02
Nonane	111-84-2	89.6	SG-1-5'	1	3.74E-07	3.35E-05	1.21E-01	5.51E-06	1.21E-01
Octane	111-65-9	46.7	SG-1-5'	1	- -	- -	- -	- -	- -
Propene	115-07-1	329	SG-3-5'	1	8.01E-07	2.63E-04	9.48E-01	4.33E-05	9.48E-01
Toluene	108-88-3	123	SG-1-5'	1	5.66E-07	6.97E-05	2.51E-01	1.15E-05	2.51E-01
Xylenes	1330-20-7	475	SG-1-5'	1	6.17E-07	2.93E-04	1.05E+00	4.81E-05	1.05E+00

Notes:

µg/m^2-s = micrograms per square meter per second
µg/m^3 = micrograms per cubic meter
D_E = effective diffusion coefficient
m = meter
m^2/s = meter squared per second

TABLE B.14
Utility Worker Subchronic Exposure at Source Property

Analyte	CAS No.	Soil Vapor Concentration ($\mu g/m^3$)	Location	Depth (m)	D_E (m^2/s)	Flux ($\mu g/m^2$ s)	Trench Air Concentration ($\mu g/m^3$)	Exposure Concentration ($\mu g/m^3$)	
								Cancer	Non-Cancer
Tetrachloroethene	127-18-4	82700	SG-6-5'	1	3.67E-07	3.04E-02	1.09E+02	4.99E-03	1.82E+01
Trichloroethene	79-01-6	1890	SG-6-5'	1	5.00E-07	9.45E-04	3.40E+00	1.55E-04	5.67E-01
cis-1,2-Dichloroethene	156-59-2	207	SG-5-5'	1	6.44E-07	1.33E-04	4.80E-01	2.19E-05	7.99E-02
Benzene	71-43-2	38.9	SG-3-5'	1	6.52E-07	2.54E-05	9.13E-02	4.17E-06	1.52E-02
1,3-Butadiene	106-99-0	36	SG-4-5'	1	7.31E-07	2.63E-05	9.47E-02	4.32E-06	1.58E-02
2-Butanone	78-93-3	44.7	SG-6-5'	1	6.67E-07	2.98E-05	1.07E-01	4.90E-06	1.79E-02
Ethylbenzene	100-41-4	135	SG-1-5'	1	4.99E-07	6.73E-05	2.42E-01	1.11E-05	4.04E-02
Hexane	110-54-3	22.2	SG-4-5'	1	5.32E-07	1.18E-05	4.25E-02	1.94E-06	7.09E-03
Nonane	111-84-2	89.6	SG-1-5'	1	3.74E-07	3.35E-05	1.21E-01	5.51E-06	2.01E-02
Octane	111-65-9	46.7	SG-1-5'	1	- -	- -	- -	- -	- -
Propene	115-07-1	329	SG-3-5'	1	8.01E-07	2.63E-04	9.48E-01	4.33E-05	1.58E-01
Toluene	108-88-3	123	SG-1-5'	1	5.66E-07	6.97E-05	2.51E-01	1.15E-05	4.18E-02
Xylenes	1330-20-7	475	SG-1-5'	1	6.17E-07	2.93E-04	1.05E+00	4.81E-05	1.76E-01

Notes:

$\mu g/m^2$-s = micrograms per square meter per second
$\mu g/m^3$ = micrograms per cubic meter
D_E = effective diffusion coefficient
m = meter
m^2/s = meter squared per second

TABLE B.15
Exposure Factors for Receptor Scenarios

Factor	Symbol	Value	Units	Source/Basis
Residential				
Exposure time	ET	24	hours/day	Assumed high-end exposure; US EPA 2002
Exposure frequency	EF	350	days/year	US EPA 1996b
Exposure duration	ED	30	years	US EPA 1996b
Averaging time, cancer	AT	613200	hours	US EPA 1996b; 70-year lifetime
Averaging time, non-cancer	AT	262800	hours	US EPA 1996b; 30-year ED
Commercial Worker				
Exposure time	ET	8	hours/day	Typical work day
Exposure frequency	EF	250	days/year	US EPA 2002
Exposure duration	ED	25	years	US EPA 2002
Averaging time, cancer	AT	613200	hours	US EPA 2002; 70-year lifetime
Averaging time, non-cancer	AT	219000	hours	US EPA 2002; 25-year ED
Passer-By				
Exposure time	ET	0.25	hours/day	Assumed activity pattern
Exposure frequency	EF	250	days/year	Work week w/ vacation
Exposure duration	ED	25	years	US EPA 2002
Averaging time, cancer	AT	613200	hours	US EPA 2002; 70-year lifetime
Averaging time, non-cancer	AT	219000	hours	US EPA 2002; 25-year ED
Utility Worker				
Exposure time	ET	4	hours/day	Assumed activity pattern
Exposure frequency	EF	7	days/week	Assumed activity pattern
Exposure duration	ED	1	week	Assumed activity pattern
Averaging time, cancer	AT	613200	hours	US EPA 2002; 70-year lifetime
Averaging time, non-cancer	AT	168	hours	1-week ED

TABLE B.16
Chronic Toxicity Values
7th Street and Arizona Avenue WQARF Site

Analyte	CAS No.	SFO (mg/kg-day)$^{-1}$	key	IUR (µg/m^3)$^{-1}$	key	RfDo (mg/kg-day)	key	RfC (mg/m^3)	key	muta-gen
Acetone	67-64-1	- -		- -		9.00E-01	I	3.10E+01	A	
Acrolein	107-02-8	- -		- -		5.00E-04	I	2.00E-05	I	
Benzene	71-43-2	5.50E-02	I	7.80E-06	I	4.00E-03	I	3.00E-02	I	
Bromodichloromethane	75-27-4	6.20E-02	I	3.70E-05	C	2.00E-02	I	- -		
1,3-Butadiene	106-99-0	3.40E+00	C	3.00E-05	I	- -		2.00E-03	I	
2-Butanone (MEK)	78-93-3	- -		- -		6.00E-01	I	5.00E+00	I	
n-Butylbenzene	104-51-8	- -		- -		5.00E-02	P	- -		
sec-Butylbenzene	135-98-8	- -		- -		- -		- -		
tert-Butylbenzene	98-06-6	- -		- -		- -		- -		
Carbon disufide	75-15-0	- -		- -		1.00E-01	I	7.00E-01	I	
Chloroform	67-66-3	3.10E-02	C	2.30E-05	I	1.00E-02	I	9.80E-02	A	
Chloromethane	74-87-3	- -		- -		- -		9.00E-02	I	
Cyclohexane	110-82-7	- -		- -		- -		6.00E+00	I	
Dibromochloromethane	124-48-1	8.40E-02	I	2.70E-05	C	2.00E-02	I	- -		
1,2-Dichlorobenzene	95-50-1	- -		- -		9.00E-02	I	2.00E-01	H	
1,3-Dichlorobenzene	541-73-1	- -		- -		- -		- -		
1,4-Dichlorobenzene	106-46-7	5.40E-03	C	1.10E-05	C	7.00E-02	A	8.00E-01	I	
Dichlorodifluoromethane (Freon 12)	75-71-8	- -		- -		2.00E-01	I	1.00E-01	X	
1,1-Dichloroethane	75-34-3	5.70E-03	C	1.60E-06	C	2.00E-01	P	- -		
1,2-Dichloroethane	107-06-2	9.10E-02	I	2.60E-05	I	6.00E-03	X	7.00E-03	P	
1,1-Dichoroethene	75-35-4	- -		- -		5.00E-02	I	2.00E-01	I	
cis-1,2-Dichloroethene	156-59-2	- -		- -		2.00E-03	I	- -		
trans-1,2-Dichloroethene	156-60-5	- -		- -		2.00E-02	I	6.00E-02	P	
1,3- Dichloropropane	142-28-9	- -		- -		2.00E-02	P	- -		
Ethyl Acetate	141-78-6	- -		- -		9.00E-01	I	- -		
Ethylbenzene	100-41-4	1.10E-02	C	2.50E-06	C	1.00E-01	I	1.00E+00	I	
4-Ethyltoluene	622-96-8	- -		- -		- -		- -		
Heptane	142-82-5	- -		- -		- -		- -		
n-Hexane	110-54-3	- -		- -		6.00E-02	H	7.00E-01	I	
2-Hexanone (MBK)	591-78-6	- -		- -		5.00E-03	I	3.00E-02	I	
Isopropylbenzene (Cumene)	98-82-8	- -		- -		1.00E-01	I	4.00E-01	I	
p-Isopropyltoluene	99-87-6	- -		- -		- -		- -		
Methylcyclohexane	108-87-2	- -		- -		- -		- -		
Methyl *tert*-butyl ether (MTBE)	1634-04-4	1.80E-03	C	2.60E-07	C	- -		3.00E+00	I	
Methylene chloride	75-09-2	2.00E-03	I	1.00E-08	I	6.00E-03	I	6.00E-01	I	M
Naphthalene	91-20-3	- -		3.40E-05	C	2.00E-02	I	3.00E-03	I	
n-Nonane	111-84-2	- -		- -		3.00E-04	X	2.00E-01	P	
Octane	111-65-9	- -		- -		- -		- -		
2-Propanol (Isopropyl alcohol)	67-63-0	- -		- -		1.00E-01	I	- -		
Propene	115-07-1	- -		- -		- -		3.00E+00	C	
n-Propylbenzene	103-65-1	- -		- -		1.00E-01	X	1.00E+00	X	
Styrene	100-42-5	- -		- -		2.00E-01	I	1.00E+00	I	
1,1,2,2-Tetrachloroethane	79-34-5	2.00E-01	I	5.80E-05	C	2.00E-02	I	- -		
Tetrachloroethene	127-18-4	2.10E-03	I	2.60E-07	I	6.00E-03	I	4.00E-02	I	
Tetrahydrofuran	109-99-9	- -		- -		9.00E-01	I	2.00E+00	I	
Toluene	108-88-3	- -		- -		8.00E-02	I	5.00E+00	I	
1,2,4-Trichlorobenzene	120-82-1	2.90E-02	P	- -		1.00E-02	I	2.00E-03	P	
1,1,2-Trichloroethane	79-00-5	5.70E-02	I	1.60E-05	I	4.00E-03	I	2.00E-04	X	
Trichloroethene	79-01-6	4.60E-02	I	4.10E-06	I	5.00E-04	I	2.00E-03	I	M

TABLE B.16
Chronic Toxicity Values
7th Street and Arizona Avenue WQARF Site

Analyte	CAS No.	SFO $(mg/kg\text{-}day)^{-1}$	key	IUR $(\mu g/m^3)^{-1}$	key	RfDo (mg/kg-day)	key	RfC (mg/m^3)	key	muta-gen
Trichlorofluoromethane	75-69-4	- -		- -		3.00E-01	I	7.00E-01	H	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	- -		- -		3.00E+01	I	3.00E+01	H	
1,2,4-Trimethylbenzene	95-63-6	- -		- -		- -		7.00E-03	P	
1,3,5-Trimethylbenzene	108-67-8	- -		- -		1.00E-02	X	- -		
2,2,4-Trimethylpentane	540-84-1	- -		- -		- -		- -		
Vinyl chloride	75-01-4	7.20E-01	I	4.40E-06	I	3.00E-03	I	1.00E-01	I	M
Xylenes (total)	1330-20-7	- -		- -		2.00E-01	I	1.00E-01	I	
m-Xylene	108-38-3	- -		- -		2.00E-01	S	1.00E-01	S	
o-xylene	95-47-6	- -		- -		2.00E-01	S	1.00E-01	S	
p-Xylene	106-42-3	- -		- -		2.00E-01	S	1.00E-01	S	

Notes:

SFO = oral cancer slope factor — *$(mg/kg\text{-}day)^{-1}$ = per milligram per kilogram per day*

IUR = inhalation unit risk — *$(\mu g/m^3)^{-1}$ = per microgram per cubic meter*

RfDo = oral reference dose — *mg/m^3 = milligram per cubic meter*

RfC = inhalation reference concentration — *mg/kg-day = milligram per kilogram per day*

- - = not available

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; S = surrogate from xylene (mixture); M = mutagen

TABLE B.17
Acute and Subchronic Reference Concentrations for Selected Chemicals

Analyte	CAS No.	Subchronic (mg/m^3)		Acute (mg/m^3)	
Tetrachloroethene	127-18-4	- -		1.36E+00	A
Trichloroethene	79-01-6	- -		- -	
cis-1,2-Dichloroethene	156-59-2	- -		- -	
Benzene	71-43-2	8.00E-02	P	2.88E-02	A
1,3-Butadiene	106-99-0	- -		- -	
2-Butanone	78-93-3	5.00E+00	I	1.30E+01	C
Ethylbenzene	100-41-4	9.00E+00	P	2.17E+01	A
Hexane	110-54-3	2.00E+00	P	- -	
Nonane	111-84-2	2.00E+00	P	- -	
Octane	111-65-9	- -		- -	
Propene	115-07-1	- -		- -	
Toluene	108-88-3	5.00E+00	P	3.77E+00	A
Xylenes	1330-20-7	4.00E-01	P	8.68E+00	A

Notes:

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA

mg/m^3 = milligram per cubic meter

- - = not available

TABLE B.18
Risk and Hazard for Residential Exposure at 7AZP-6

Analyte	CAS No.	Exposure Concentration ($\mu g/m^3$)		IUR $(\mu g/m^3)^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Slab-on-grade							
Tetrachloroethene	127-18-4	1.05E+00	2.45E+00	2.60E-07	4.00E-02	2.7E-07	6.1E-02
Trichloroethene	79-01-6	1.15E-01	2.68E-01	4.10E-06	2.00E-03	4.7E-07	1.3E-01
cis-1,2-Dichloroethene	156-59-2	7.47E-03	1.74E-02	- -	- -	- -	- -
Methyl *tert*-butyl ether	1634-04-4	1.01E-02	2.35E-02	2.60E-07	3.00E+00	2.6E-09	7.8E-06
					Sum	7.5E-07	1.9E-01
Basement							
Tetrachloroethene	127-18-4	1.20E+00	2.80E+00	2.60E-07	4.00E-02	3.1E-07	7.0E-02
Trichloroethene	79-01-6	1.30E-01	3.03E-01	4.10E-06	2.00E-03	5.3E-07	1.5E-01
cis-1,2-Dichloroethene	156-59-2	8.53E-03	1.99E-02	- -	- -	- -	- -
Methyl *tert*-butyl ether	1634-04-4	1.10E-02	2.56E-02	2.60E-07	3.00E+00	2.8E-09	8.5E-06
					Sum	8.5E-07	2.2E-01

Notes:

$\mu g/m^3$ = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

TABLE B.19
TCE ADAF Calculation for 7AZP-6

Inhalation (concentration-equivalence across age groups)

Col A	Col B	Col C	Col D	Col E	Col F	Col G	Col H	Col I	Col J	Col K	Col L
	Exposure scenario parameters				Dose-response assessment calculations						
Units:		(µg/m³ air)	yr	-	(µg/m³ air)$^{-1}$	-	-	(µg/m³ air)$^{-1}$	(µg/m³ air)$^{-1}$	-	-
Age group	risk per µg/m³ air equivalence	Exposure concentration	Age group duration	Duration adjustment (Col D / 70 yr)	Kidney unadjusted lifetime unit risk (p 5-137 [5.2.2.1.4])	Kidney cancer default ADAF	Kidney ADAF-adjusted partial risk (Col B x Col C x Col E x Col F x Col G)	Kidney+NHL+ liver unadjusted lifetime unit risk (p 5-139 [5.2.2.2])	NHL+ liver lifetime unit risk (Col I – Col F)	NHL and liver partial risk (Col B x Col C x Col E x Col J)	Total partial risk (Col H + Col K)
Birth to <1 month	1	0.279	0.083	0.0012	1.0E-06	10	**3.3E-09**	4.1E-06	3.1E-06	**1.0E-09**	**4.4E-09**
1 to <3 months	1	0.279	0.167	0.0024	1.0E-06	10	**6.6E-09**	4.1E-06	3.1E-06	**2.1E-09**	**8.7E-09**
3 to <6 months	1	0.279	0.250	0.0036	1.0E-06	10	**1.0E-08**	4.1E-06	3.1E-06	**3.1E-09**	**1.3E-08**
6 to <12 months	1	0.279	0.500	0.0071	1.0E-06	10	**2.0E-08**	4.1E-06	3.1E-06	**6.2E-09**	**2.6E-08**
1 to <2 years	1	0.279	1.000	0.0143	1.0E-06	10	**4.0E-08**	4.1E-06	3.1E-06	**1.2E-08**	**5.2E-08**
2 to <3 years	1	0.279	1.000	0.0143	1.0E-06	3	**1.2E-08**	4.1E-06	3.1E-06	**1.2E-08**	**2.4E-08**
3 to <6 years	1	0.279	3.000	0.0429	1.0E-06	3	**3.6E-08**	4.1E-06	3.1E-06	**3.7E-08**	**7.3E-08**
6 to <11 years	1	0.279	5.000	0.0714	1.0E-06	3	**6.0E-08**	4.1E-06	3.1E-06	**6.2E-08**	**1.2E-07**
11 to <16 years	1	0.279	5.000	0.0714	1.0E-06	3	**6.0E-08**	4.1E-06	3.1E-06	**6.2E-08**	**1.2E-07**
16 to <18	1	0.279	2.000	0.0286	1.0E-06	1	**8.0E-09**	4.1E-06	3.1E-06	**2.5E-08**	**3.3E-08**
18 to <21	1	0.279	3.000	0.0429	1.0E-06	1	**1.2E-08**	4.1E-06	3.1E-06	**3.7E-08**	**4.9E-08**
21 to <30	1	0.279	9.000	0.1286	1.0E-06	1	**3.6E-08**	4.1E-06	3.1E-06	**1.1E-07**	**1.5E-07**
30 to 70	1	0.000	40.000	0.5714	1.0E-06	1	**0.0E+00**	4.1E-06	3.1E-06	**0.0E+00**	**0.0E+00**
										Total unit risk:	**6.7E-07**

Note:

Highlighed = *cells can be adjusted depending on exposure scenario (e.g., in Col C, set to 0 for age groups without exposure)*

µg/m³ = microgram per cubic meter
ADAF = age-dependent adjustment factor
NHL = non-Hodgkins lymphoma

TABLE B.20
Risk and Hazard for Residential Exposure at MW-PD-6

Analyte	CAS No.	Exposure Concentration ($\mu g/m^3$)		IUR $(\mu g/m^3)^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Slab-on-grade							
Tetrachloroethene	127-18-4	3.42E+00	7.98E+00	2.60E-07	4.00E-02	8.9E-07	2.0E-01
Basement							
Tetrachloroethene	127-18-4	3.89E+00	9.08E+00	2.60E-07	4.00E-02	1.0E-06	2.3E-01

Notes:
$\mu g/m^3$ = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter

TABLE B.21
Risk and Hazard for Commercial Worker Exposure Adjacent to Source Property

Analyte	CAS No.	Exposure Concentration (µg/m^3)		IUR (µg/m^3)$^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Slab-on-grade							
Tetrachloroethene	127-18-4	2.02E+02	5.66E+02	2.60E-07	4.00E-02	5.3E-05	1.4E+01
Trichloroethene	79-01-6	4.62E+00	1.29E+01	4.10E-06	2.00E-03	1.9E-05	6.5E+00
cis-1,2-Dichloroethene	156-59-2	5.06E-01	1.42E+00	- -	- -	- -	- -
trans-1,2-Dichloroethene	156-60-5	7.90E-02	2.21E-01	- -	6.00E-02	- -	3.7E-03
Benzene	71-43-2	9.52E-02	2.66E-01	7.80E-06	3.00E-02	7.4E-07	8.9E-03
1,3-Butadiene	106-99-0	8.81E-02	2.47E-01	3.00E-05	2.00E-03	2.6E-06	1.2E-01
2-Butanone (MEK)	78-93-3	1.09E-01	3.06E-01	- -	5.00E+00	- -	6.1E-05
Chloroform	67-66-3	1.24E-03	3.48E-03	2.30E-05	9.80E-02	2.9E-08	3.6E-05
Cyclohexane	110-82-7	6.57E-03	1.84E-02	- -	6.00E+00	- -	3.1E-06
Ethylbenzene	100-41-4	3.30E-01	9.25E-01	2.50E-06	1.00E+00	8.3E-07	9.2E-04
Hexane	110-54-3	5.43E-02	1.52E-01	- -	7.00E-01	- -	2.2E-04
Nonane	111-84-2	2.19E-01	6.14E-01	- -	2.00E-01	- -	3.1E-03
Octane	111-65-9	1.14E-01	3.20E-01	- -	- -	- -	- -
Propene	115-07-1	8.05E-01	2.25E+00	- -	3.00E+00	- -	7.5E-04
Tetrahydrofuran	109-99-9	2.04E-03	5.72E-03	- -	2.00E+00	- -	2.9E-06
Toluene	108-88-3	3.01E-01	8.42E-01	- -	5.00E+00	- -	1.7E-04
1,2,4-Trimethylbenzene	95-63-6	5.45E-02	1.53E-01	- -	7.00E-03	- -	2.2E-02
1,3,5-Trimethylbenzene	108-67-8	3.19E-02	8.95E-02	- -	- -	- -	- -
2,2,4-Trimethylpentane	540-84-1	1.18E-03	3.29E-03	- -	- -	- -	- -
Vinyl chloride	75-01-4	2.16E-03	6.03E-03	4.40E-06	1.00E-01	9.5E-09	6.0E-05
Xylenes	1330-20-7	1.16E+00	3.25E+00	- -	1.00E-01	- -	3.3E-02
					Sum	7.6E-05	2.1E+01

TABLE B.21
Risk and Hazard for Commercial Worker Exposure Adjacent to Source Property

Analyte	CAS No.	Exposure Concentration ($\mu g/m^3$)		IUR $(\mu g/m^3)^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Basement							
Tetrachloroethene	127-18-4	2.02E+02	5.66E+02	2.60E-07	4.00E-02	5.3E-05	1.4E+01
Trichloroethene	79-01-6	4.62E+00	1.29E+01	4.10E-06	2.00E-03	1.9E-05	6.5E+00
cis-1,2-Dichloroethene	156-59-2	5.06E-01	1.42E+00	- -	- -	- -	- -
trans-1,2-Dichloroethene	156-60-5	8.96E-02	2.51E-01	- -	6.00E-02	- -	4.2E-03
Benzene	71-43-2	9.52E-02	2.66E-01	7.80E-06	3.00E-02	7.4E-07	8.9E-03
1,3-Butadiene	106-99-0	8.81E-02	2.47E-01	3.00E-05	2.00E-03	2.6E-06	1.2E-01
2-Butanone (MEK)	78-93-3	1.09E-01	3.06E-01	- -	5.00E+00	- -	6.1E-05
Chloroform	67-66-3	1.34E-03	3.75E-03	2.30E-05	9.80E-02	3.1E-08	3.8E-05
Cyclohexane	110-82-7	7.32E-03	2.05E-02	- -	6.00E+00	- -	3.4E-06
Ethylbenzene	100-41-4	3.30E-01	9.25E-01	2.50E-06	1.00E+00	8.3E-07	9.2E-04
Hexane	110-54-3	5.43E-02	1.52E-01	- -	7.00E-01	- -	2.2E-04
Nonane	111-84-2	2.19E-01	6.14E-01	- -	2.00E-01	- -	3.1E-03
Octane	111-65-9	1.14E-01	3.20E-01	- -	- -	- -	- -
Propene	115-07-1	8.05E-01	2.25E+00	- -	3.00E+00	- -	7.5E-04
Tetrahydrofuran	109-99-9	1.89E-03	5.31E-03	- -	2.00E+00	- -	2.7E-06
Toluene	108-88-3	3.01E-01	8.42E-01	- -	5.00E+00	- -	1.7E-04
1,2,4-Trimethylbenzene	95-63-6	6.35E-02	1.78E-01	- -	7.00E-03	- -	2.5E-02
1,3,5-Trimethylbenzene	108-67-8	3.72E-02	1.04E-01	- -	- -	- -	- -
2,2,4-Trimethylpentane	540-84-1	1.35E-03	3.78E-03	- -	- -	- -	- -
Vinyl chloride	75-01-4	2.32E-03	6.49E-03	4.40E-06	1.00E-01	1.0E-08	6.5E-05
Xylenes	1330-20-7	1.16E+00	3.25E+00	- -	1.00E-01	- -	3.3E-02
					Sum	7.6E-05	2.1E+01

Notes:

$\mu g/m^3$ = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

TABLE B.22
Risk and Hazard Estimates for PCE and TCE at Shallow Soil Vapor Probe Locations

Probe Location	Soil Vapor Concentration ($\mu g/m^3$)	Indoor Air Concentration ($\mu g/m^3$)	Exposure Concentration ($\mu g/m^3$)		Cancer Risk	Hazard
			Cancer	Non-Cancer		
Tetrachloroethene						
SG-1-5'	886	2.66E+01	2.17E+00	6.07E+00	5.6E-07	1.5E-01
SG-2-5'	2410	7.23E+01	5.90E+00	1.65E+01	1.5E-06	4.1E-01
SG-3-5'	2260	6.78E+01	5.53E+00	1.55E+01	1.4E-06	3.9E-01
SG-4-5'	3030	9.09E+01	7.41E+00	2.08E+01	1.9E-06	5.2E-01
SG-5-5'	12300	3.69E+02	3.01E+01	8.42E+01	7.8E-06	2.1E+00
SG-8-5'	4350	1.31E+02	1.06E+01	2.98E+01	2.8E-06	7.4E-01
SG-9-4'	82700	2.48E+03	2.02E+02	5.66E+02	5.3E-05	1.4E+01
SG-10-5'	25500	7.65E+02	6.24E+01	1.75E+02	1.6E-05	4.4E+00
SG-11-5'	1600	4.80E+01	3.91E+00	1.10E+01	1.0E-06	2.7E-01
Trichloroethene						
SG-1-5'	<13.4	< 4.02E-01	< 3.28E-02	< 9.18E-02	< 1.3E-07	< 4.6E-02
SG-2-5'	<53.7	< 1.61E+00	< 1.31E-01	< 3.68E-01	< 5.4E-07	< 1.8E-01
SG-3-5'	<53.7	< 1.61E+00	< 1.31E-01	< 3.68E-01	< 5.4E-07	< 1.8E-01
SG-4-5'	43.0	1.29E+00	1.05E-01	2.95E-01	4.3E-07	1.5E-01
SG-5-5'	1,890	5.67E+01	4.62E+00	1.29E+01	1.9E-05	6.5E+00
SG-8-5'	<53.7	< 1.61E+00	< 1.31E-01	< 3.68E-01	< 5.4E-07	< 1.8E-01
SG-9-4'	266	7.98E+00	6.51E-01	1.82E+00	2.7E-06	9.1E-01
SG-10-5'	<269.	< 8.07E+00	< 6.58E-01	< 1.84E+00	< 2.7E-06	< 9.2E-01
SG-11-5'	<26.9	< 8.07E-01	< 6.58E-02	< 1.84E-01	< 2.7E-07	< 9.2E-02

Notes:

$\mu g/m^3$ = micrograms per cubic meter

TABLE B.23
Risk and Hazard for Commercial Worker Exposure at YC-6

Analyte	CAS No.	Exposure Concentration (µg/m^3) Cancer	Exposure Concentration (µg/m^3) Non-Cancer	IUR (µg/m^3)$^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
Slab-on-grade							
Tetrachloroethene	127-18-4	3.83E-03	1.07E-02	2.60E-07	4.00E-02	1.0E-09	2.7E-04
Trichloroethene	79-01-6	1.60E-04	4.49E-04	4.10E-06	2.00E-03	6.6E-10	2.2E-04
Benzene	71-43-2	7.89E-05	2.21E-04	7.80E-06	3.00E-02	6.2E-10	7.4E-06
2-Butanone (MEK)	78-93-3	4.52E-03	1.26E-02	- -	5.00E+00	- -	2.5E-06
1,4-Dichlorobenzene	106-46-7	7.97E-05	2.23E-04	1.10E-05	8.00E-01	8.8E-10	2.8E-07
Heptane	142-82-5	2.52E-04	7.06E-04	- -	- -	- -	- -
Hexane	110-54-3	7.01E-04	1.96E-03	- -	7.00E-01	- -	2.8E-06
Methylcyclohexane	108-87-2	7.34E-04	2.05E-03	- -	- -	- -	- -
Tetrahydrofuran	109-99-9	2.25E-03	6.30E-03	- -	2.00E+00	- -	3.2E-06
Toluene	108-88-3	4.06E-04	1.14E-03	- -	5.00E+00	- -	2.3E-07
1,2,4-Trimethylbenzene	95-63-6	7.54E-05	2.11E-04	- -	7.00E-03	- -	3.0E-05
2,2,4-Trimethylpentane	540-84-1	4.07E-04	1.14E-03	- -	- -	- -	- -
Xylenes (total)	1330-20-7	1.81E-04	5.08E-04	- -	1.00E-01	- -	5.1E-06
					Sum	3.1E-09	5.4E-04
Basement							
Tetrachloroethene	127-18-4	4.35E-03	1.22E-02	2.60E-07	4.00E-02	1.1E-09	3.0E-04
Trichloroethene	79-01-6	1.79E-04	5.02E-04	4.10E-06	2.00E-03	7.4E-10	2.5E-04
Benzene	71-43-2	8.69E-05	2.43E-04	7.80E-06	3.00E-02	6.8E-10	8.1E-06
2-Butanone (MEK)	78-93-3	5.04E-03	1.41E-02	- -	5.00E+00	- -	2.8E-06
1,4-Dichlorobenzene	106-46-7	9.10E-05	2.55E-04	1.10E-05	8.00E-01	1.0E-09	3.2E-07
Heptane	142-82-5	2.90E-04	8.13E-04	- -	- -	- -	- -
Hexane	110-54-3	6.53E-04	1.83E-03	- -	7.00E-01	- -	2.6E-06
Methylcyclohexane	108-87-2	8.31E-04	2.33E-03	- -	- -	- -	- -
Tetrahydrofuran	109-99-9	2.44E-03	6.84E-03	- -	2.00E+00	- -	3.4E-06
Toluene	108-88-3	4.48E-04	1.25E-03	- -	5.00E+00	- -	2.5E-07
1,2,4-Trimethylbenzene	95-63-6	8.76E-05	2.45E-04	- -	7.00E-03	- -	3.5E-05
2,2,4-Trimethylpentane	540-84-1	4.76E-04	1.33E-03	- -	- -	- -	- -
Xylenes (total)	1330-20-7	2.07E-04	5.78E-04	- -	1.00E-01	- -	5.8E-06
					Sum	3.5E-09	6.1E-04

Notes:

µg/m^3 = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

TABLE B.24
Risk and Hazard for Commercial Worker Exposure at MW-PD-1

Analyte	CAS No.	Exposure Concentration ($\mu g/m^3$)		IUR $(\mu g/m^3)^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Slab-on-grade							
Tetrachloroethene	127-18-4	1.23E-01	3.45E-01	2.60E-07	4.00E-02	3.2E-08	8.6E-03
Trichloroethene	79-01-6	1.50E-02	4.21E-02	4.10E-06	2.00E-03	6.2E-08	2.1E-02
cis-1,2-Dichloroethene	156-59-2	2.63E-02	7.35E-02	- -	- -	- -	- -
trans-1,2-Dichloroethene	1634-04-4	8.85E-03	2.48E-02	- -	6.00E-02	- -	4.1E-04
Methyl *tert*-butyl ether	1634-04-4	1.14E-03	3.19E-03	2.60E-07	3.00E+00	3.0E-10	1.1E-06
Toluene	108-88-3	1.55E-03	4.35E-03	- -	5.00E+00	- -	8.7E-07
					Sum	9.4E-08	3.0E-02
Basement							
Tetrachloroethene	127-18-4	1.39E-01	3.90E-01	2.60E-07	4.00E-02	3.6E-08	9.7E-03
Trichloroethene	79-01-6	1.67E-02	4.68E-02	4.10E-06	2.00E-03	6.8E-08	2.3E-02
cis-1,2-Dichloroethene	156-59-2	2.96E-02	8.27E-02	- -	- -	- -	- -
trans-1,2-Dichloroethene	1634-04-4	1.00E-02	2.81E-02	- -	6.00E-02	- -	4.7E-04
Methyl *tert*-butyl ether	1634-04-4	1.21E-03	3.38E-03	2.60E-07	3.00E+00	3.1E-10	1.1E-06
Toluene	108-88-3	1.70E-03	4.76E-03	- -	5.00E+00	- -	9.5E-07
					Sum	1.1E-07	3.4E-02

Notes:

$\mu g/m^3$ = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

TABLE B.25
Risk and Hazard for Passer-By Exposure at Source Property

Analyte	CAS No.	Exposure Concentration (µg/m^3)		IUR (µg/m^3)$^{-1}$	RfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Tetrachloroethene	127-18-4	2.53E-03	7.07E-03	2.60E-07	4.00E-02	6.6E-10	1.8E-04
Trichloroethene	79-01-6	1.16E-04	3.26E-04	4.10E-06	2.00E-03	4.8E-10	1.6E-04
cis-1,2-Dichloroethene	156-59-2	1.84E-06	5.14E-06	- -	- -	- -	- -
trans-1,2-Dichloroethene	156-60-5	3.47E-07	9.72E-07	- -	6.00E-02	- -	1.6E-08
Benzene	71-43-2	3.49E-07	9.78E-07	7.80E-06	3.00E-02	2.7E-12	3.3E-08
1,3-Butadiene	106-99-0	3.62E-07	1.01E-06	3.00E-05	2.00E-03	1.1E-11	5.1E-07
2-Butanone	78-93-3	1.16E-04	3.24E-04	- -	5.00E+00	- -	6.5E-08
Chloroform	67-66-3	1.00E-06	2.81E-06	2.30E-05	9.80E-02	2.3E-11	2.9E-08
Ethylbenzene	100-41-4	9.28E-07	2.60E-06	2.50E-06	1.00E+00	2.3E-12	2.6E-09
Hexane	110-54-3	1.63E-07	4.56E-07	- -	7.00E-01	- -	6.5E-10
Nonane	111-84-2	4.62E-07	1.29E-06	- -	2.00E-01	- -	6.5E-09
Octane	111-65-9	- -	- -	- -	- -	- -	- -
Propene	115-07-1	4.92E-06	1.38E-05	- -	3.00E+00	- -	4.6E-09
Toluene	108-88-3	9.60E-07	2.69E-06	- -	5.00E+00	- -	5.4E-10
1,2,4-Trimethylbenzene	95-63-6	2.54E-06	7.13E-06	- -	7.00E-03	- -	1.0E-06
1,3,5-Trimethylbenzene	108-67-8	1.49E-06	4.17E-06	- -	- -	- -	- -
Vinyl chloride	75-01-4	1.07E-07	3.00E-07	4.40E-06	1.00E-01	4.7E-13	3.0E-09
Xylenes	1330-20-7	4.04E-06	1.13E-05	- -	1.00E-01	- -	1.1E-07
					Sum	1.2E-09	3.4E-04

Notes:
µg/m^3 = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter

TABLE B.26
Risk and Hazard for Utility Worker Acute Exposure at Source Property

Analyte	CAS No.	Exposure Concentration ($\mu g/m^3$)		IUR $(\mu g/m^3)^{-1}$	aRfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Tetrachloroethene	127-18-4	4.99E-03	1.09E+02	2.60E-07	1.36E+00	1.3E-09	8.0E-02
Trichloroethene	79-01-6	1.55E-04	3.40E+00	4.10E-06	- -	6.4E-10	- -
cis-1,2-Dichloroethene	156-59-2	2.19E-05	4.80E-01	- -	- -	- -	- -
Benzene	71-43-2	4.17E-06	9.13E-02	7.80E-06	2.88E-02	3.3E-11	3.2E-03
1,3-Butadiene	106-99-0	4.32E-06	9.47E-02	3.00E-05	- -	1.3E-10	- -
2-Butanone	78-93-3	4.90E-06	1.07E-01	- -	1.30E+01	- -	8.3E-06
Ethylbenzene	100-41-4	1.11E-05	2.42E-01	2.50E-06	2.17E+01	2.8E-11	1.1E-05
Hexane	110-54-3	1.94E-06	4.25E-02	- -	- -	- -	- -
Nonane	111-84-2	5.51E-06	1.21E-01	- -	- -	- -	- -
Octane	111-65-9	- -	- -	- -	- -	- -	- -
Propene	115-07-1	4.33E-05	9.48E-01	- -	- -	- -	- -
Toluene	108-88-3	1.15E-05	2.51E-01	- -	3.77E+00	- -	6.7E-05
Xylenes	1330-20-7	4.81E-05	1.05E+00	- -	8.68E+00	- -	1.2E-04
					Sum	2.1E-09	8.4E-02

Notes:

$\mu g/m^3$ = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

TABLE B.27
Risk and Hazard for Utility Worker Subchronic Exposure at Source Property

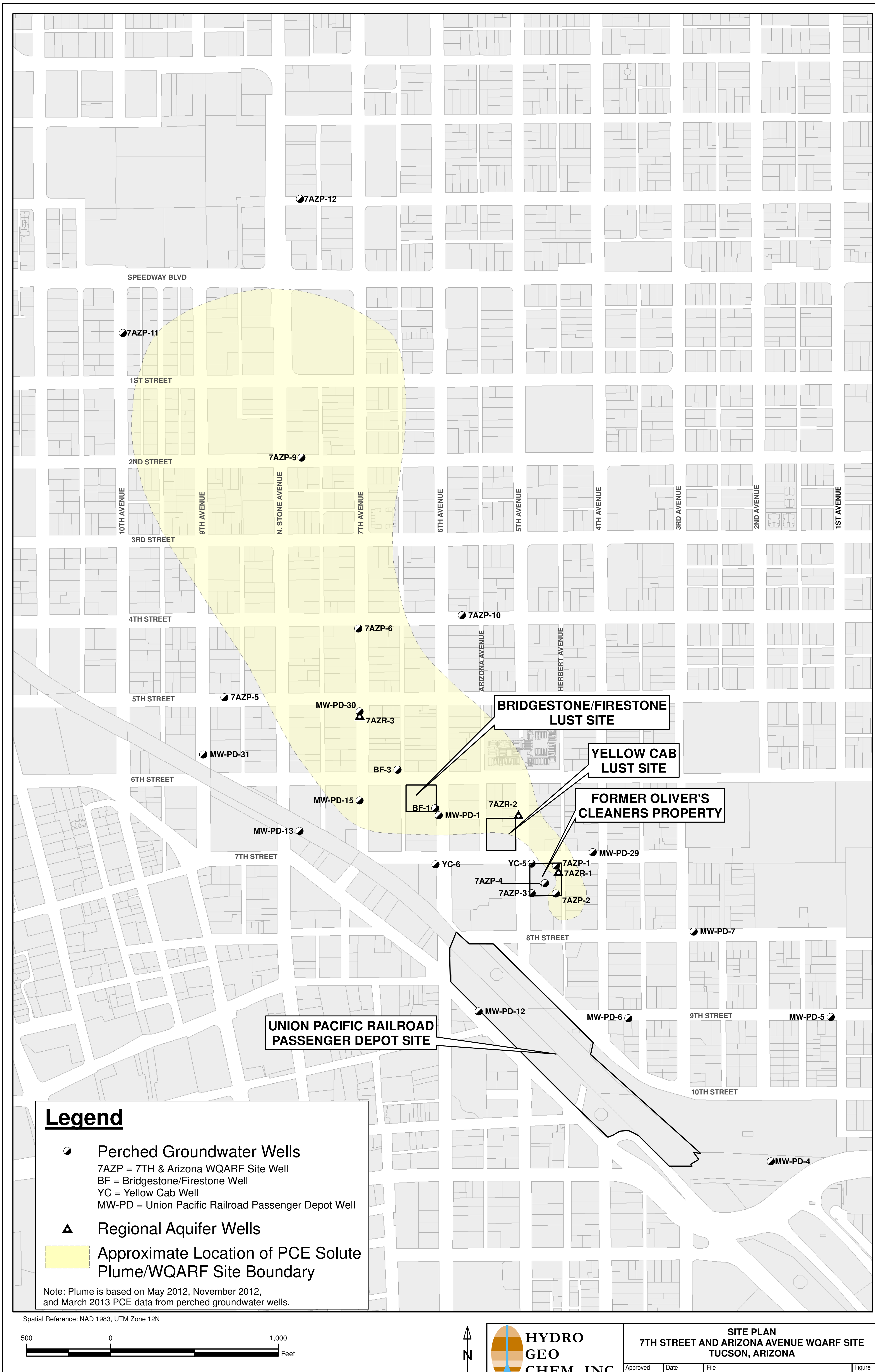
Analyte	CAS No.	Exposure Concentration (µg/m^3)		IUR (µg/m^3)$^{-1}$	sRfC (mg/m^3)	Cancer Risk	Hazard
		Cancer	Non-Cancer				
Tetrachloroethene	127-18-4	4.99E-03	1.82E+01	2.60E-07	- -	1.3E-09	- -
Trichloroethene	79-01-6	1.55E-04	5.67E-01	4.10E-06	- -	6.4E-10	- -
cis-1,2-Dichloroethene	156-59-2	2.19E-05	7.99E-02	- -	- -	- -	- -
Benzene	71-43-2	4.17E-06	1.52E-02	7.80E-06	8.00E-02	3.3E-11	1.9E-04
1,3-Butadiene	106-99-0	4.32E-06	1.58E-02	3.00E-05	- -	1.3E-10	- -
2-Butanone	78-93-3	4.90E-06	1.79E-02	- -	5.00E+00	- -	3.6E-06
Ethylbenzene	100-41-4	1.11E-05	4.04E-02	2.50E-06	9.00E+00	2.8E-11	4.5E-06
Hexane	110-54-3	1.94E-06	7.09E-03	- -	2.00E+00	- -	3.5E-06
Nonane	111-84-2	5.51E-06	2.01E-02	- -	2.00E+00	- -	1.0E-05
Octane	111-65-9	- -	- -	- -	- -	- -	- -
Propene	115-07-1	4.33E-05	1.58E-01	- -	- -	- -	- -
Toluene	108-88-3	1.15E-05	4.18E-02	- -	5.00E+00	- -	8.4E-06
Xylenes	1330-20-7	4.81E-05	1.76E-01	- -	4.00E-01	- -	4.4E-04
					Sum	2.1E-09	6.6E-04

Notes:

µg/m^3 = micrograms per cubic meter

mg/m^3 = milligrams per cubic meter

FIGURES


SPEEDWAY BLVD
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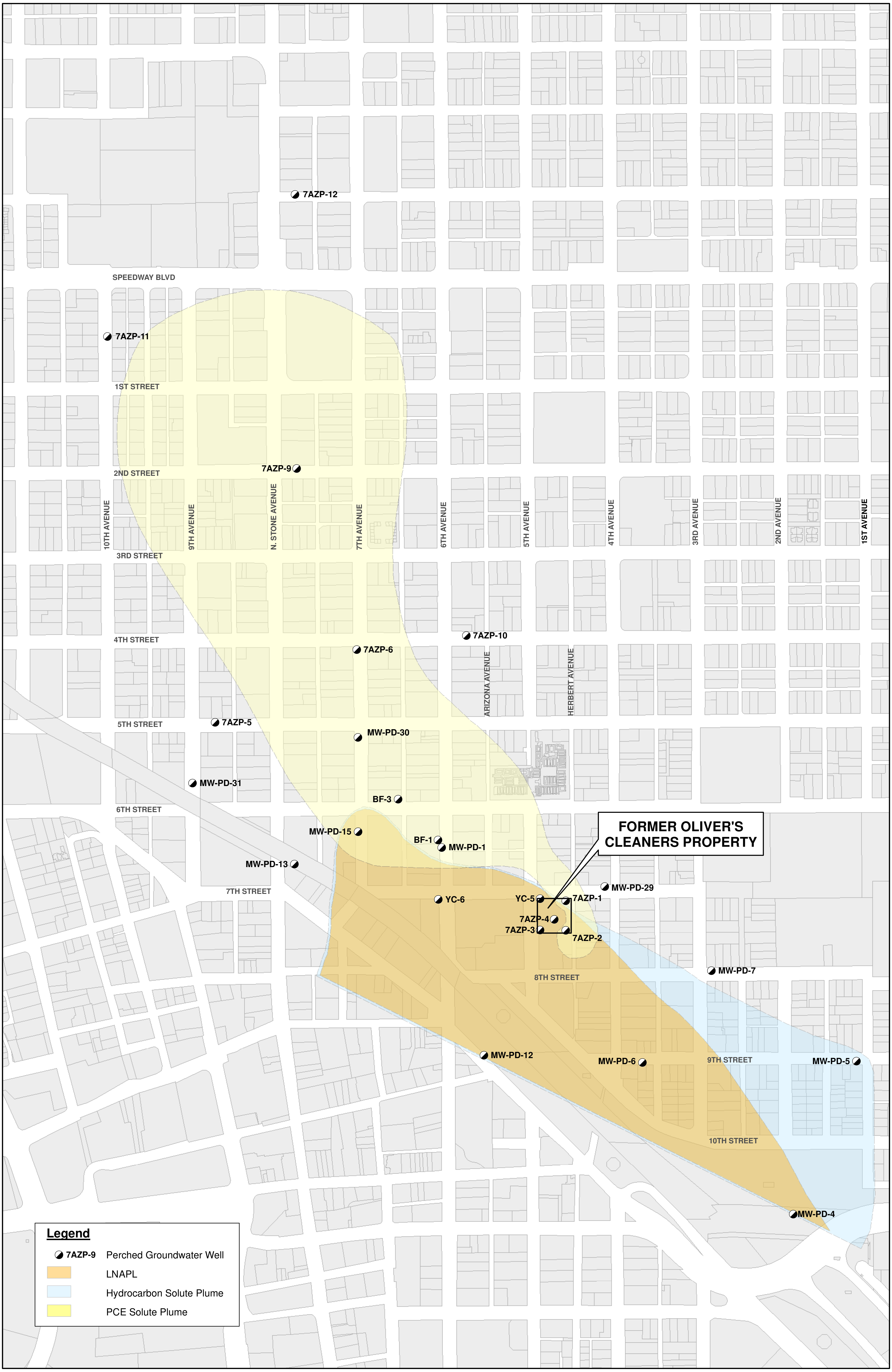
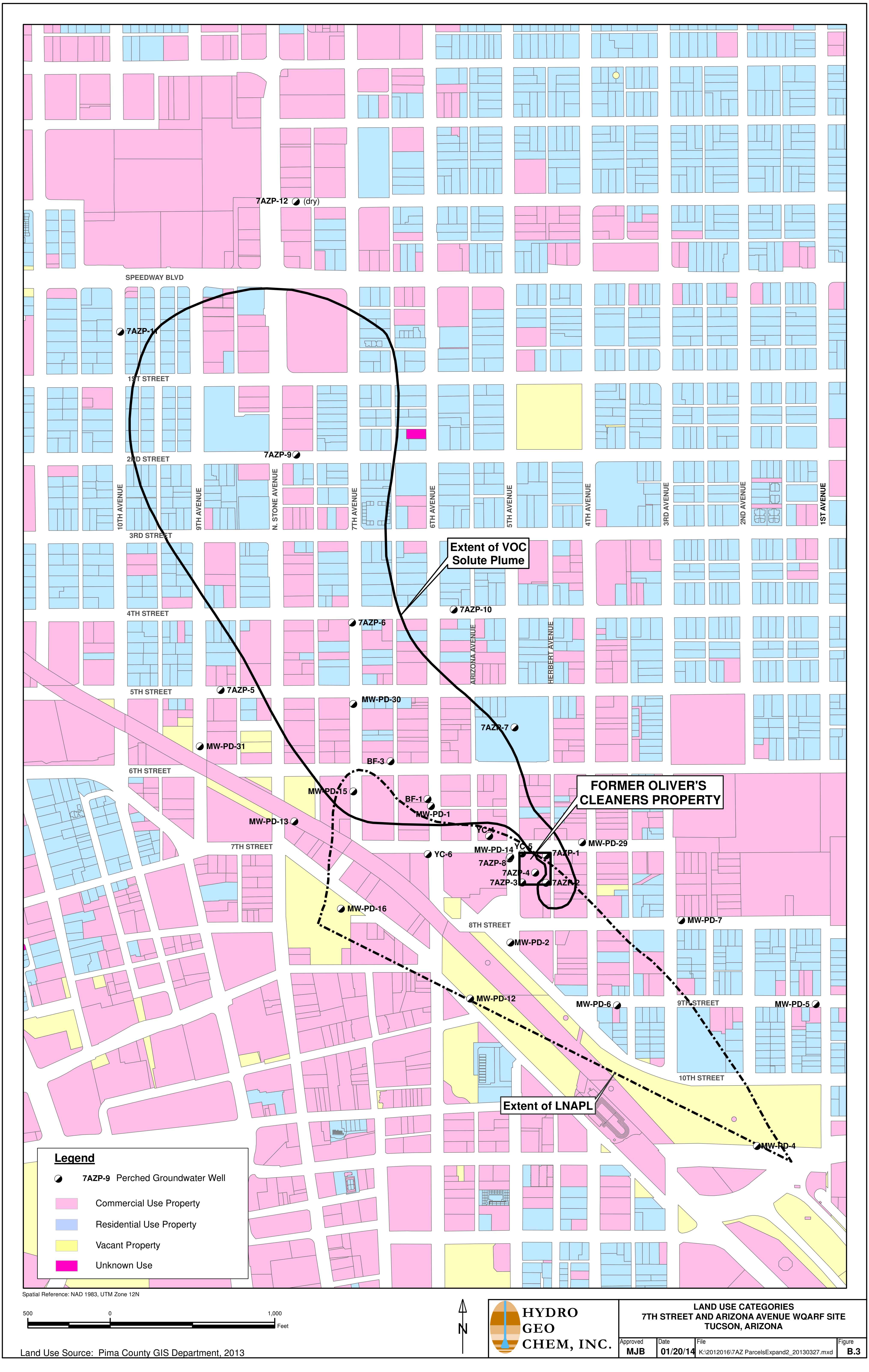
2ND STREET
3RD STREET
4TH STREET
5TH STREET
6TH STREET
7TH STREET
8TH STREET
9TH STREET
10TH STREET
10TH AVENUE
9TH AVENUE
N. STONE AVENUE
7TH AVENUE
6TH AVENUE
5TH AVENUE
4TH AVENUE
3RD AVENUE
2ND AVENUE
1ST AVENUE
ARIZONA AVENUE
HERBERT AVENUE
7AZP-12
7AZP-11
7AZP-9
7AZP-10
7AZP-6
7AZP-5
MW-PD-30
7AZR-3
MW-PD-31
BF-3
MW-PD-15
BF-1
MW-PD-1
7AZR-2
MW-PD-13
YC-6
YC-5
7AZP-1
7AZR-1
7AZP-4
7AZP-3
7AZP-2
MW-PD-29
MW-PD-7
MW-PD-12
MW-PD-6
MW-PD-5
MW-PD-4
BRIDGESTONE/FIRESTONE LUST SITE
YELLOW CAB LUST SITE
FORMER OLIVER'S CLEANERS PROPERTY
UNION PACIFIC RAILROAD PASSENGER DEPOT SITE
Legend
Perched Groundwater Wells
7AZP = 7TH & Arizona WQARF Site Well
BF = Bridgestone/Firestone Well
YC = Yellow Cab Well
MW-PD = Union Pacific Railroad Passenger Depot Well
Regional Aquifer Wells
Approximate Location of PCE Solute Plume/WQARF Site Boundary
Note: Plume is based on May 2012, November 2012, and March 2013 PCE data from perched groundwater wells.
Spatial Reference: NAD 1983, UTM Zone 12N
500
0
1,000
Feet
N
HYDRO GEO CHEM, INC.
SITE PLAN
7TH STREET AND ARIZONA AVENUE WQARF SITE
TUCSON, ARIZONA
Approved
MJB
Date
01/17/14
File
K:\2012016\7AZ Site Plan_20130213
Figure
B.1



HYDRO GEO CHEM, INC.

EXTENT OF LNAPL AND GROUNDWATER SOLUTE PLUMES
7TH STREET AND ARIZONA AVENUE WQARF SITE
TUCSON, ARIZONA

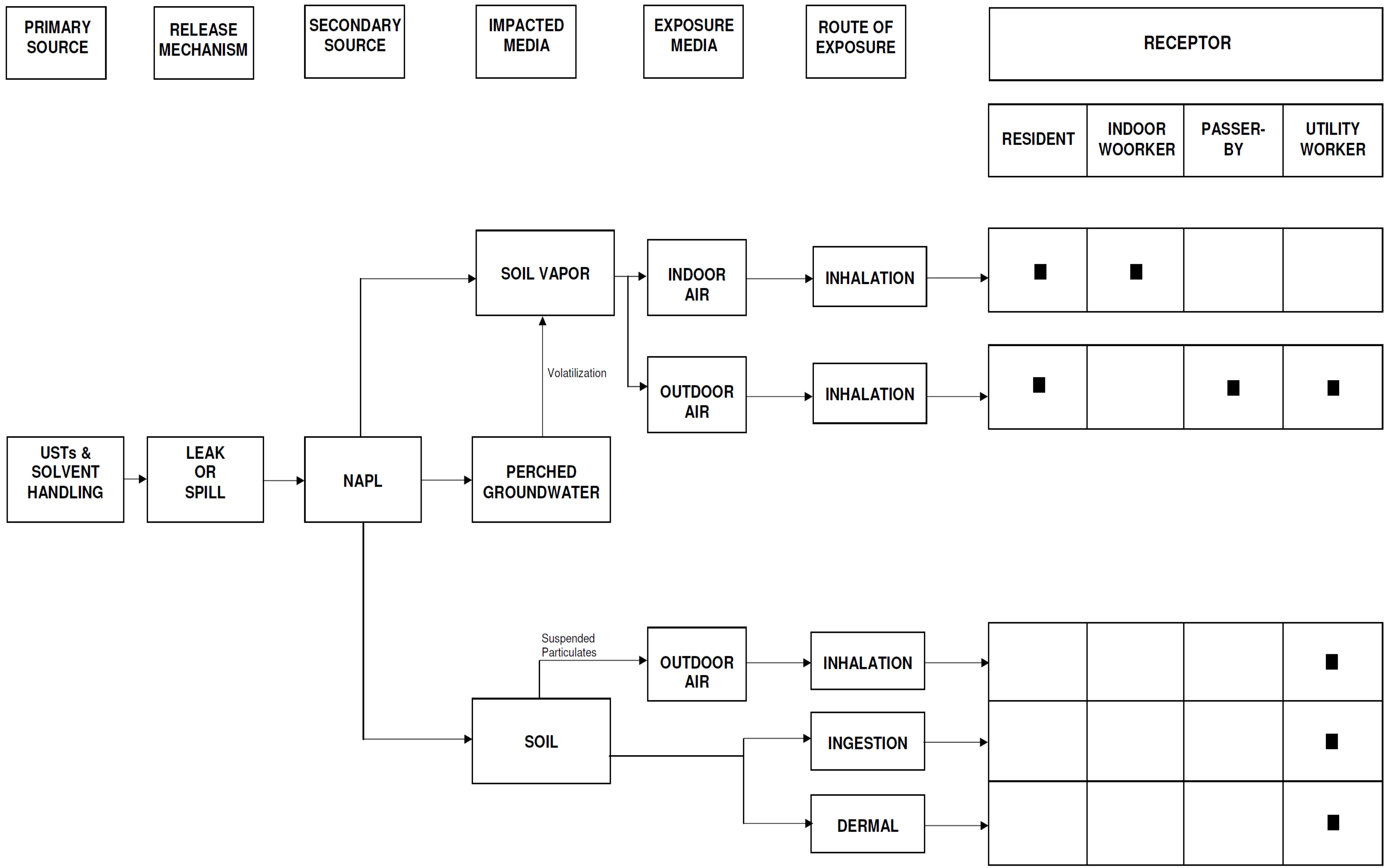
Approved	Date	File	Figure
MJB	01/22/14	K:\2012016\7AZ Plumes_20130213.mxd	B.2



Land Use Source: Pima County GIS Department, 2013

HYDRO GEO CHEM, INC.

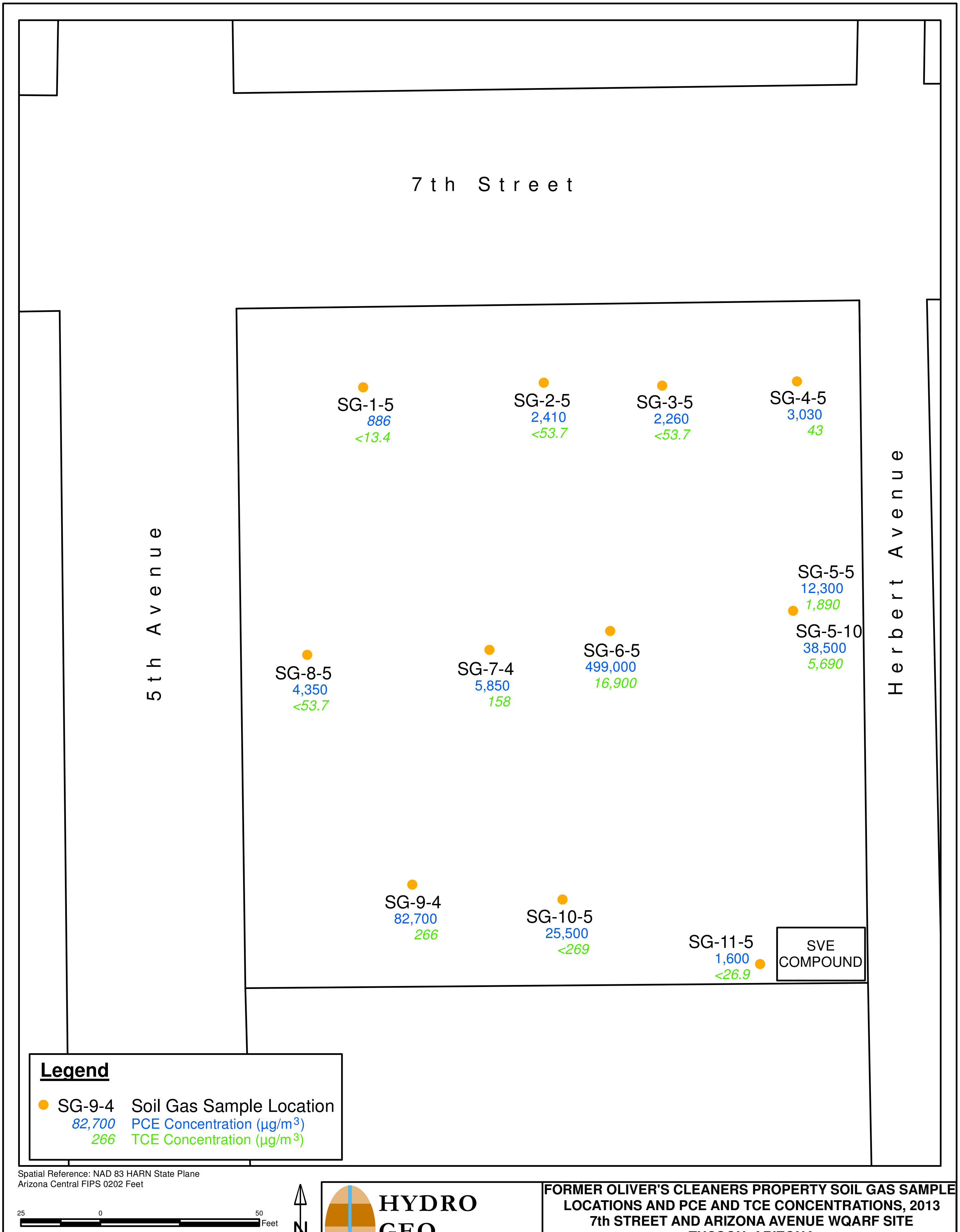
LAND USE CATEGORIES 7TH STREET AND ARIZONA AVENUE WQARF SITE TUCSON, ARIZONA			
Approved	Date	File	Figure
MJB	01/20/14	K:\2012016\7AZ ParcelsExpand2_20130327.mxd	B.3



HYDRO GEO CHEM, INC.

CONCEPTUAL DIAGRAM OF POTENTIAL EXPOSURE

Approved	Date	Author	Date	File Name	Figure
MJB	2/21/13	MJB	5/16/13	Figure 6	B.4



HYDRO GEO CHEM, INC.

FORMER OLIVER'S CLEANERS PROPERTY SOIL GAS SAMPLE LOCATIONS AND PCE AND TCE CONCENTRATIONS, 2013
7th STREET AND ARIZONA AVENUE WQARF SITE
TUCSON, ARIZONA

Approved	Date	File Name	Figure
MJB	01/17/14	K:\2012016\7AZ SourceProperty SoilGasWells	B. 5

APPENDIX B.1

JOHNSON AND ETTINGER MODEL SPREADSHEETS FOR 7AZP-6

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	3.59E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	457	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
442	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	3.59E+04	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	442

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
15	3.59E+04	0.10	2.94E+01	5.27E-03	4.00E+02	3.56E+60	5.00E-04	1.80E+01

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156592	1.23E+02			cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
Lookup Soil Parameters				
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	0.0E+00	3.5E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1966	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.23E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,581	4.07E-03	1.66E-01	1.80E-04	5.38E-03	1966

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
15	1.23E+02	0.10	2.94E+01	5.38E-03	4.00E+02	1.71E+59	1.48E-04	1.82E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.5E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
1634044	1.23E+02			MTBE

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.02E-01	1.05E-05	6.23E-04	25	6,678	328.30	497.10	0.0E+00	3.0E+00	88.15

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1966	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.23E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,099	6.23E-04	2.55E-02	1.80E-04	7.49E-03	1966

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.23E+02	0.10	2.94E+01	7.49E-03	4.00E+02	3.70E+42	1.99E-04	2.45E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E+00

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	1.76E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1966	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.76E+04	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1966

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.76E+04	0.10	2.94E+01	5.27E-03	4.00E+02	3.56E+60	1.45E-04	2.55E+00

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
79016	1.77E+03			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.1E-04	4.0E-02	131.39

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1966	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.77E+03	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,369	1.03E-02	4.20E-01	1.80E-04	5.78E-03	1966

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.77E+03	0.10	2.94E+01	5.78E-03	4.00E+02	1.53E+55	1.58E-04	2.79E-01

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
1.1E-04	4.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	3.59E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	457	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
257	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	3.59E+04	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	257

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	3.59E+04	0.10	2.02E+01	5.27E-03	4.00E+02	4.37E+41	5.14E-04	1.84E+01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156592	1.23E+02			cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	0.0E+00	3.5E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1781	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.23E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,581	4.07E-03	1.66E-01	1.80E-04	5.38E-03	1781

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	1.23E+02	0.10	2.02E+01	5.38E-03	4.00E+02	5.42E+40	1.69E-04	2.07E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.5E-02

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
1634044	1.23E+02			MTBE

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.02E-01	1.05E-05	6.23E-04	25	6,678	328.30	497.10	0.0E+00	3.0E+00	88.15

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1781	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.23E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,099	6.23E-04	2.55E-02	1.80E-04	7.49E-03	1781

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	1.23E+02	0.10	2.02E+01	7.49E-03	4.00E+02	1.88E+29	2.17E-04	2.67E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E+00

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	1.76E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1781	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.76E+04	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1781

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	1.76E+04	0.10	2.02E+01	5.27E-03	4.00E+02	4.37E+41	1.66E-04	2.92E+00

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
79016	1.77E+03			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1981	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.1E-04	4.0E-02	131.39

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1781	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.77E+03	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,369	1.03E-02	4.20E-01	1.80E-04	5.78E-03	1781

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	1.77E+03	0.10	2.02E+01	5.78E-03	4.00E+02	8.93E+37	1.78E-04	3.16E-01

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
1.1E-04	4.0E-02

END

APPENDIX B.2

JOHNSON AND ETTINGER MODEL SPREADSHEETS FOR MW-PD-6

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	5.17E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1768	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1753	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.17E+04	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1753

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	5.17E+04	0.10	8.33E+01	5.27E-03	4.00E+02	5.92E+171	1.71E-04	8.85E+00

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	5.17E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1768	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1753	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.17E+04	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1753

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
15	5.17E+04	0.10	2.94E+01	5.27E-03	4.00E+02	3.56E+60	1.61E-04	8.32E+00

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	5.17E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1768	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1568	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.17E+04	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1568

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	5.17E+04	0.10	8.33E+01	5.27E-03	4.00E+02	5.92E+171	2.22E-04	1.15E+01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	5.17E+04			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1768	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

Lookup Soil Parameters

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1568	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.17E+04	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1568

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	5.17E+04	0.10	2.02E+01	5.27E-03	4.00E+02	4.37E+41	1.83E-04	9.47E+00

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

APPENDIX B.3

JOHNSON AND ETTINGER MODEL SPREADSHEETS FOR SOURCE PROPERTY AREA

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
95636	4.92E+03			1,2,4-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1789	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	6.0E-03	120.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1774	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.92E+03	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	11,503	6.14E-03	2.51E-01	1.80E-04	4.43E-03	1774

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.92E+03	0.10	2.94E+01	4.43E-03	4.00E+02	8.72E+71	1.36E-04	6.69E-01

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108678	2.90E+03			1,3,5-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1789	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1774	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.90E+03	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	11,482	5.87E-03	2.40E-01	1.80E-04	4.40E-03	1774

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.90E+03	0.10	2.94E+01	4.40E-03	4.00E+02	2.62E+72	1.35E-04	3.92E-01

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
540841	6.06E+01			2,2,4-Trimethylpentane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	914	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

Lookup Soil Parameters

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
5.74E-02	7.06E-06	3.26E+00	25	7,359	372.40	543.90	0.0E+00	0.0E+00	114.23

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
899	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.06E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,469	3.26E+00	1.33E+02	1.80E-04	4.20E-03	899

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	6.06E+01	0.10	2.94E+01	4.20E-03	4.00E+02	8.97E+75	2.38E-04	1.44E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
67663	6.93E+01			Chloroform

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1798	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	2.3E-05	0.0E+00	119.38

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1783	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.93E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,397	3.66E-03	1.50E-01	1.80E-04	7.61E-03	1783

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	6.93E+01	0.10	2.94E+01	7.61E-03	4.00E+02	8.30E+41	2.20E-04	1.52E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
2.3E-05	NA

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110827	4.13E+02			Cyclohexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1585	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, $\rho_b{}^A$ (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w{}^V$ (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.00E-02	9.11E-06	1.50E-01	25	7,163	353.90	554.00	0.0E+00	0.0E+00	0.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1570	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.13E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,819	1.50E-01	6.13E+00	1.80E-04	5.85E-03	1570

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.13E+02	0.10	2.94E+01	5.85E-03	4.00E+02	3.26E+54	1.95E-04	8.06E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156605	5.54E+03			trans-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1585	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.07E-02	1.19E-05	9.36E-03	25	6,717	320.85	516.50	0.0E+00	7.0E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1570	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.54E+03	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	6,975	9.36E-03	3.82E-01	1.80E-04	5.17E-03	1570

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	5.54E+03	0.10	2.94E+01	5.17E-03	4.00E+02	4.61E+61	1.75E-04	9.69E-01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
109999	4.13E+01			Tetrahydrofuran

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	457	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
9.54E-02	1.08E-05	7.05E-05	25	7,125	339.00	540.20	0.0E+00	0.0E+00	0.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
442	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.13E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,599	7.05E-05	2.88E-03	1.80E-04	6.99E-03	442

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.13E+01	0.10	2.94E+01	6.99E-03	4.00E+02	4.11E+45	6.07E-04	2.51E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
75014	1.20E+02			Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1829	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	8.8E-06	1.0E-01	62.50

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1814	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.20E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	4,828	2.69E-02	1.10E+00	1.80E-04	7.75E-03	1814

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.20E+02	0.10	2.94E+01	7.75E-03	4.00E+02	1.35E+41	2.20E-04	2.64E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
8.8E-06	1.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
95636	4.92E+03			1,2,4-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1789	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	6.0E-03	120.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1589	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.92E+03	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	11,503	6.14E-03	2.51E-01	1.80E-04	4.43E-03	1589

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	4.92E+03	0.10	2.02E+01	4.43E-03	4.00E+02	2.97E+49	1.58E-04	7.79E-01

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108678	2.90E+03			1,3,5-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1789	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1589	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.90E+03	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	11,482	5.87E-03	2.40E-01	1.80E-04	4.40E-03	1589

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	2.90E+03	0.10	2.02E+01	4.40E-03	4.00E+02	6.34E+49	1.57E-04	4.56E-01

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
540841	6.06E+01			2,2,4-Trimethylpentane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	914	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
5.74E-02	7.06E-06	3.26E+00	25	7,359	372.40	543.90	0.0E+00	0.0E+00	114.23

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
714	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.06E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,469	3.26E+00	1.33E+02	1.80E-04	4.20E-03	714

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	6.06E+01	0.10	2.02E+01	4.20E-03	4.00E+02	1.71E+52	2.73E-04	1.66E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
67663	6.93E+01			Chloroform

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1798	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	2.3E-05	0.0E+00	119.38

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm³/cm³)	Vadose zone effective total fluid saturation, S_{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k_i (cm²)	Vadose zone soil relative air permeability, k_{rg} (cm²)	Vadose zone soil effective vapor permeability, k_v (cm²)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m³)	Bldg. ventilation rate, $Q_{building}$ (cm³/s)
1598	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.93E+01	2.54E+04

Area of enclosed space below grade, A_B (cm²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m³/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm²/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,397	3.66E-03	1.50E-01	1.80E-04	7.61E-03	1598

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm³/s)	Crack effective diffusion coefficient, D^{crack} (cm²/s)	Area of crack, A_{crack} (cm²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m³)
200	6.93E+01	0.10	2.02E+01	7.61E-03	4.00E+02	6.72E+28	2.37E-04	1.64E-02

Unit risk factor, URF (μg/m³)⁻¹	Reference conc., RfC (mg/m³)
2.3E-05	NA

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110827	4.13E+02			Cyclohexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1585	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.00E-02	9.11E-06	1.50E-01	25	7,163	353.90	554.00	0.0E+00	0.0E+00	0.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1385	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.13E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,819	1.50E-01	6.13E+00	1.80E-04	5.85E-03	1385

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	4.13E+02	0.10	2.02E+01	5.85E-03	4.00E+02	3.08E+37	2.17E-04	8.98E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156605	5.54E+03			trans-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1585	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

Lookup Soil Parameters

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.07E-02	1.19E-05	9.36E-03	25	6,717	320.85	516.50	0.0E+00	7.0E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1385	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.54E+03	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	6,975	9.36E-03	3.82E-01	1.80E-04	5.17E-03	1385

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	5.54E+03	0.10	2.02E+01	5.17E-03	4.00E+02	2.55E+42	1.98E-04	1.10E+00

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
109999	4.13E+01			Tetrahydrofuran

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	457	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)		ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09		

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
9.54E-02	1.08E-05	7.05E-05	25	7,125	339.00	540.20	0.0E+00	0.0E+00	0.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
257	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.13E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,599	7.05E-05	2.88E-03	1.80E-04	6.99E-03	257

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	4.13E+01	0.10	2.02E+01	6.99E-03	4.00E+02	2.34E+31	5.63E-04	2.32E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
75014	1.20E+02			Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1829	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	8.8E-06	1.0E-01	62.50

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1629	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.20E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	4,828	2.69E-02	1.10E+00	1.80E-04	7.75E-03	1629

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	1.20E+02	0.10	2.02E+01	7.75E-03	4.00E+02	1.92E+28	2.37E-04	2.84E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
8.8E-06	1.0E-01

END

APPENDIX B.4

JOHNSON AND ETTINGER MODEL SPREADSHEETS FOR YC-6

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
106467	6.01E+00			1,4-Dichlorobenzene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	0.0E+00	8.0E-01	147.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.01E+00	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	11,087	2.39E-03	9.78E-02	1.80E-04	5.05E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	6.01E+00	0.10	2.94E+01	5.05E-03	4.00E+02	1.52E+63	1.63E-04	9.77E-04

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	8.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
95636	6.40E+00			1,2,4-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	6.0E-03	120.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm³/cm³)	Vadose zone effective total fluid saturation, S_{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k_i (cm²)	Vadose zone soil relative air permeability, k_{rg} (cm²)	Vadose zone soil effective vapor permeability, k_v (cm²)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m³)	Bldg. ventilation rate, $Q_{building}$ (cm³/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.40E+00	1.69E+04

Area of enclosed space below grade, A_B (cm²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m³/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm²/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	11,503	6.14E-03	2.51E-01	1.80E-04	4.43E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm³/s)	Crack effective diffusion coefficient, D^{crack} (cm²/s)	Area of crack, A_{crack} (cm²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m³)
15	6.40E+00	0.10	2.94E+01	4.43E-03	4.00E+02	8.72E+71	1.44E-04	9.24E-04

Unit risk factor, URF (μg/m³)⁻¹	Reference conc., RfC (mg/m³)
NA	6.0E-03

END

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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
540841	3.63E+01			2,2,4-Trimethylpentane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
5.74E-02	7.06E-06	3.26E+00	25	7,359	372.40	543.90	0.0E+00	0.0E+00	114.23

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	3.63E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,469	3.26E+00	1.33E+02	1.80E-04	4.20E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	3.63E+01	0.10	2.94E+01	4.20E-03	4.00E+02	8.97E+75	1.37E-04	4.99E-03

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

DATA ENTRY SHEET

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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	4.79E+00			Benzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	7.8E-06	3.0E-02	78.11

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.79E+00	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,967	5.54E-03	2.26E-01	1.80E-04	6.44E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.79E+00	0.10	2.94E+01	6.44E-03	4.00E+02	3.47E+49	2.02E-04	9.68E-04

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.8E-06	3.0E-02

END

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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
142825	2.01E+01			Heptane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.49E-02	7.59E-06	2.27E+00	25	7,593	371.50	540.00	0.0E+00	0.0E+00	100.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.01E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,752	2.27E+00	9.28E+01	1.80E-04	4.75E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.01E+01	0.10	2.94E+01	4.75E-03	4.00E+02	1.50E+67	1.54E-04	3.09E-03

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110543	2.15E+01			Hexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	2.0E-01	86.18

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.15E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,535	1.66E+00	6.79E+01	1.80E-04	1.46E-02	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.15E+01	0.10	2.94E+01	1.46E-02	4.00E+02	6.29E+21	4.00E-04	8.60E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	2.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
78933	2.95E+02			Methylethylketone (2-butanone)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.95E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,231	5.58E-05	2.28E-03	1.80E-04	5.92E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.95E+02	0.10	2.94E+01	5.92E-03	4.00E+02	6.77E+53	1.88E-04	5.54E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	5.0E+00

END

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Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108872	5.23E+01			Methylcyclohexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.35E-02	8.52E-06	1.03E-01	25	7,474	373.90	572.20	0.0E+00	3.0E+00	98.21

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.23E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,417	1.03E-01	4.20E+00	1.80E-04	5.38E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	5.23E+01	0.10	2.94E+01	5.38E-03	4.00E+02	2.07E+59	1.72E-04	9.00E-03

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E+00

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	2.78E+02			Tetrachloroethylene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.78E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.78E+02	0.10	2.94E+01	5.27E-03	4.00E+02	3.56E+60	1.69E-04	4.70E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
79016	1.07E+01			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.1E-04	4.0E-02	131.39

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.07E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,369	1.03E-02	4.20E-01	1.80E-04	5.78E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
15	1.07E+01	0.10	2.94E+01	5.78E-03	4.00E+02	1.53E+55	1.84E-04	1.96E-03

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
1.1E-04	4.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
109999	1.27E+02			Tetrahydrofuran

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
9.54E-02	1.08E-05	7.05E-05	25	7,125	339.00	540.20	0.0E+00	0.0E+00	0.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.27E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,599	7.05E-05	2.88E-03	1.80E-04	6.99E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.27E+02	0.10	2.94E+01	6.99E-03	4.00E+02	4.11E+45	2.17E-04	2.76E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108883	2.49E+01			Toluene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	4.0E-01	92.14

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (µg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.49E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,990	6.62E-03	2.71E-01	1.80E-04	6.36E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m^3)
15	2.49E+01	0.10	2.94E+01	6.36E-03	4.00E+02	1.29E+50	2.00E-04	4.98E-03

Unit risk factor, URF (µg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	4.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108383	1.35E+01			m-Xylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.00E-02	7.80E-06	7.32E-03	25	8,523	412.27	617.05	0.0E+00	1.0E-01	106.17

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1661	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.35E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	10,078	7.32E-03	2.99E-01	1.80E-04	5.12E-03	1661

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.35E+01	0.10	2.94E+01	5.12E-03	4.00E+02	1.91E+62	1.65E-04	2.22E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	1.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
106467	6.01E+00			1,4-Dichlorobenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	0.0E+00	8.0E-01	147.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm³/cm³)	Vadose zone effective total fluid saturation, S_{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k_i (cm²)	Vadose zone soil relative air permeability, k_{rg} (cm²)	Vadose zone soil effective vapor permeability, k_v (cm²)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m³)	Bldg. ventilation rate, $Q_{building}$ (cm³/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.01E+00	2.54E+04

Area of enclosed space below grade, A_B (cm²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m³/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm²/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	11,087	2.39E-03	9.78E-02	1.80E-04	5.05E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm³/s)	Crack effective diffusion coefficient, D^{crack} (cm²/s)	Area of crack, A_{crack} (cm²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m³)
200	6.01E+00	0.10	2.02E+01	5.05E-03	4.00E+02	2.81E+43	1.86E-04	1.12E-03

Unit risk factor, URF (μg/m³)⁻¹	Reference conc., RfC (mg/m³)
NA	8.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
95636	6.40E+00			1,2,4-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	6.0E-03	120.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	6.40E+00	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	11,503	6.14E-03	2.51E-01	1.80E-04	4.43E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	6.40E+00	0.10	2.02E+01	4.43E-03	4.00E+02	2.97E+49	1.68E-04	1.07E-03

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

DATA ENTRY SHEET

SG-SCREEN
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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
540841	3.63E+01			2,2,4-Trimethylpentane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
5.74E-02	7.06E-06	3.26E+00	25	7,359	372.40	543.90	0.0E+00	0.0E+00	114.23

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	3.63E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,469	3.26E+00	1.33E+02	1.80E-04	4.20E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	3.63E+01	0.10	2.02E+01	4.20E-03	4.00E+02	1.71E+52	1.61E-04	5.83E-03

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

SG-SCREEN
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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	4.79E+00			Benzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	7.8E-06	3.0E-02	78.11

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	4.79E+00	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,967	5.54E-03	2.26E-01	1.80E-04	6.44E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	4.79E+00	0.10	2.02E+01	6.44E-03	4.00E+02	1.17E+34	2.22E-04	1.07E-03

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
7.8E-06	3.0E-02

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)		ENTER Soil gas conc., C_g (ppmv)	Chemical
142825	2.01E+01	OR		Heptane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25		OR	3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.49E-02	7.59E-06	2.27E+00	25	7,593	371.50	540.00	0.0E+00	0.0E+00	100.20

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.01E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,752	2.27E+00	9.28E+01	1.80E-04	4.75E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	2.01E+01	0.10	2.02E+01	4.75E-03	4.00E+02	1.57E+46	1.77E-04	3.56E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110543	2.15E+01			Hexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	2.0E-01	86.18

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.15E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,535	1.66E+00	6.79E+01	1.80E-04	1.46E-02	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	2.15E+01	0.10	2.02E+01	1.46E-02	4.00E+02	9.79E+14	3.73E-04	8.01E-03

Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	2.0E-01

END

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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
78933	2.95E+02			Methylethylketone (2-butanone)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

Lookup Soil Parameters

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.95E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,231	5.58E-05	2.28E-03	1.80E-04	5.92E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	2.95E+02	0.10	2.02E+01	5.92E-03	4.00E+02	1.05E+37	2.09E-04	6.18E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	5.0E+00

END

DATA ENTRY SHEET

SG-SCREEN
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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108872	5.23E+01			Methylcyclohexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
Lookup Soil Parameters				
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.35E-02	8.52E-06	1.03E-01	25	7,474	373.90	572.20	0.0E+00	3.0E+00	98.21

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.23E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,417	1.03E-01	4.20E+00	1.80E-04	5.38E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	5.23E+01	0.10	2.02E+01	5.38E-03	4.00E+02	6.18E+40	1.95E-04	1.02E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E+00

END

SG-SCREEN
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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g (μg/m^3)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	2.78E+02			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.78E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	2.78E+02	0.10	2.02E+01	5.27E-03	4.00E+02	4.37E+41	1.92E-04	5.33E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

SG-SCREEN
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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
79016	1.07E+01			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.1E-04	4.0E-02	131.39

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm³/cm³)	Vadose zone effective total fluid saturation, S_{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k_i (cm²)	Vadose zone soil relative air permeability, k_{rg} (cm²)	Vadose zone soil effective vapor permeability, k_v (cm²)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m³)	Bldg. ventilation rate, $Q_{building}$ (cm³/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.07E+01	2.54E+04

Area of enclosed space below grade, A_B (cm²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m³/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm²/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,369	1.03E-02	4.20E-01	1.80E-04	5.78E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm³/s)	Crack effective diffusion coefficient, D^{crack} (cm²/s)	Area of crack, A_{crack} (cm²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m³)
200	1.07E+01	0.10	2.02E+01	5.78E-03	4.00E+02	8.93E+37	2.06E-04	2.20E-03

Unit risk factor, URF (μg/m³)⁻¹	Reference conc., RfC (mg/m³)
1.1E-04	4.0E-02

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
109999	1.27E+02			Tetrahydrofuran

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
9.54E-02	1.08E-05	7.05E-05	25	7,125	339.00	540.20	0.0E+00	0.0E+00	0.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.27E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,599	7.05E-05	2.88E-03	1.80E-04	6.99E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	1.27E+02	0.10	2.02E+01	6.99E-03	4.00E+02	2.34E+31	2.36E-04	3.00E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	NA

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108883	2.49E+01			Toluene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

Lookup Soil Parameters

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	4.0E-01	92.14

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	2.49E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,990	6.62E-03	2.71E-01	1.80E-04	6.36E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	2.49E+01	0.10	2.02E+01	6.36E-03	4.00E+02	2.89E+34	2.21E-04	5.49E-03

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	4.0E-01

END

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Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108383	1.35E+01			m-Xylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1676	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.00E-02	7.80E-06	7.32E-03	25	8,523	412.27	617.05	0.0E+00	1.0E-01	106.17

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1476	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.35E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	10,078	7.32E-03	2.99E-01	1.80E-04	5.12E-03	1476

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	1.35E+01	0.10	2.02E+01	5.12E-03	4.00E+02	6.76E+42	1.88E-04	2.53E-03

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	1.0E-01

END

APPENDIX B.5

JOHNSON AND ETTINGER MODEL SPREADSHEETS FOR MW-PD-1

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156592	1.70E+03			cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	0.0E+00	3.5E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1494	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.70E+03	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,581	4.07E-03	1.66E-01	1.80E-04	5.38E-03	1494

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
15	1.70E+03	0.10	2.94E+01	5.38E-03	4.00E+02	1.71E+59	1.89E-04	3.22E-01

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.5E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
1634044	5.52E+01			MTBE

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.02E-01	1.05E-05	6.23E-04	25	6,678	328.30	497.10	0.0E+00	3.0E+00	88.15

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1494	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.52E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	7,099	6.23E-04	2.55E-02	1.80E-04	7.49E-03	1494

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	5.52E+01	0.10	2.94E+01	7.49E-03	4.00E+02	3.70E+42	2.53E-04	1.40E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E+00

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	8.14E+03			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm³/cm³)	Vadose zone effective total fluid saturation, S_{te} (cm³/cm³)	Vadose zone soil intrinsic permeability, k_i (cm²)	Vadose zone soil relative air permeability, k_{rg} (cm²)	Vadose zone soil effective vapor permeability, k_v (cm²)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m³)	Bldg. ventilation rate, $Q_{building}$ (cm³/s)
1494	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	8.14E+03	1.69E+04

Area of enclosed space below grade, A_B (cm²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m³/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm²/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1494

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm³/s)	Crack effective diffusion coefficient, D^{crack} (cm²/s)	Area of crack, A_{crack} (cm²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m³)
15	8.14E+03	0.10	2.94E+01	5.27E-03	4.00E+02	3.56E+60	1.86E-04	1.51E+00

Unit risk factor, URF (μg/m³)⁻¹	Reference conc., RfC (mg/m³)
5.9E-06	6.0E-01

END

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Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
79016	9.13E+02			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

Lookup Soil Parameters

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.1E-04	4.0E-02	131.39

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1494	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	9.13E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,369	1.03E-02	4.20E-01	1.80E-04	5.78E-03	1494

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
15	9.13E+02	0.10	2.94E+01	5.78E-03	4.00E+02	1.53E+55	2.02E-04	1.84E-01

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
1.1E-04	4.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156605	5.94E+02			trans-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.07E-02	1.19E-05	9.36E-03	25	6,717	320.85	516.50	0.0E+00	7.0E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1494	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.94E+02	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	6,975	9.36E-03	3.82E-01	1.80E-04	5.17E-03	1494

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	5.94E+02	0.10	2.94E+01	5.17E-03	4.00E+02	4.61E+61	1.83E-04	1.09E-01

Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-02

END

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Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108883	8.67E+01			Toluene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	4.0E-01	92.14

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1494	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	8.67E+01	1.69E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	4.00E-04	15	8,990	6.62E-03	2.71E-01	1.80E-04	6.36E-03	1494

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	8.67E+01	0.10	2.94E+01	6.36E-03	4.00E+02	1.29E+50	2.20E-04	1.90E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	4.0E-01

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156592	1.70E+03			cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	0.0E+00	3.5E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1309	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	1.70E+03	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,581	4.07E-03	1.66E-01	1.80E-04	5.38E-03	1309

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	1.70E+03	0.10	2.02E+01	5.38E-03	4.00E+02	5.42E+40	2.13E-04	3.62E-01

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.5E-02

END

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Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
1634044	5.52E+01			MTBE

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.02E-01	1.05E-05	6.23E-04	25	6,678	328.30	497.10	0.0E+00	3.0E+00	88.15

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1309	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.52E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	7,099	6.23E-04	2.55E-02	1.80E-04	7.49E-03	1309

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	5.52E+01	0.10	2.02E+01	7.49E-03	4.00E+02	1.88E+29	2.68E-04	1.48E-02

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E+00

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	8.14E+03			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	6.0E-01	165.83

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1309	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	8.14E+03	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	9,400	1.84E-02	7.50E-01	1.80E-04	5.27E-03	1309

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	8.14E+03	0.10	2.02E+01	5.27E-03	4.00E+02	4.37E+41	2.10E-04	1.71E+00

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
5.9E-06	6.0E-01

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
79016	9.13E+02			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.1E-04	4.0E-02	131.39

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (μg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1309	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	9.13E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,369	1.03E-02	4.20E-01	1.80E-04	5.78E-03	1309

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)
200	9.13E+02	0.10	2.02E+01	5.78E-03	4.00E+02	8.93E+37	2.24E-04	2.05E-01

Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
1.1E-04	4.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
156605	5.94E+02			trans-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.07E-02	1.19E-05	9.36E-03	25	6,717	320.85	516.50	0.0E+00	7.0E-02	96.94

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. (µg/m^3)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1309	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	5.94E+02	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	6,975	9.36E-03	3.82E-01	1.80E-04	5.17E-03	1309

Convection path length, L_p (cm)	Source vapor conc., C_{source} (µg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (µg/m^3)
200	5.94E+02	0.10	2.02E+01	5.17E-03	4.00E+02	2.55E+42	2.07E-04	1.23E-01

Unit risk factor, URF (µg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-02

END

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108883	8.67E+01			Toluene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	1509	25			3.00E-08

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
	1.8	0.32	0.09	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	4.0E-01	92.14

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
1309	0.230	#N/A	#N/A	#N/A	3.00E-08	4,000	8.67E+01	2.54E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.80E+06	2.22E-04	200	8,990	6.62E-03	2.71E-01	1.80E-04	6.36E-03	1309

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
200	8.67E+01	0.10	2.02E+01	6.36E-03	4.00E+02	2.89E+34	2.40E-04	2.08E-02

Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
NA	4.0E-01

END